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Elementary School

SCIENCE

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Field trips will provide many opportunities for children to study natural science first hand.

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Foreword

In 1957 a new program in elementary science was introduced into Alberta schools. This 1963 edition represents a minor revision of that program. Some changes in placement of content have been made as a result of recommendations from groups of teachers who evaluated the 1957 program during the 1960-61 school year. Developments in space travel since 1957 seemed to necessitate the inclusion of some new material in that area. This outline is meant to provide a minimum program as well as to allow for flexibility and enrichment.

It should be noted that the major changes in this edition are in Grades IV-VI inclusive. Teachers of Grades I-III may continue to use the 1957 edition.

The Objectives of Elementary Science

GENERALIZATIONS

It seems that tradition urges us always to think in terms of the subject matter that children should learn in science. The subject matter of science is important but not in the sense of memorizing the number of legs a giant water bug has, or the class of lever of which the wheelbarrow is an example, or the migration route of the Arctic tern. These facts assume scientific import only as they help children to interpret their environment. The study of science, then, should help girls and boys come to know some generalizations or scientific principles which they can use in solving problems in their environment. This will involve practically all of the fundamental skills, reading to find out, writing to make records as well as involving skill in identifying problems, planning together and evaluating. It implies that teachers should do less telling and more guiding in finding solutions to problems. The children do build necessary science concepts if the teacher plans and arranges the necessary learning experiences. Concepts develop as the result of many and varied experiences.

PROBLEM SOLVING

A second major contribution that the study of science should make is to help children grow in ability to solve problems. It is highly improbable that children become better problem solvers by filling in blanks in a workbook or by memorizing scientific facts. Good problem solvers should result if experiments are performed in which certain findings are sometimes rejected, as a result of further experiments, and in which all findings are double checked. Conclusions are formed as a result of a number of experiments. Children must have practice in problem solving—in solving problems that have meaning to children, problems that are important to them. With this continued practice, the children learn there is a process in solving problems that brings reliable results. Let us not suppose that children do not have these problems; they encounter them in every-day experiences, they come upon them in their reading, they see other people experience them. The solving of problems, if properly done, will involve gathering materials, reading to find answers, seeing experiments performed, handling apparatus, doing experiments, planning interviews, devising ways and means, observing and checking results, and recording findings. Co-operative solution of problems will increase children's ability to work together. They learn to give and take both advice and criticism. Successfully solving a problem is always a satisfying experience.

SCIENTIFIC ATTITUDE

Elementary science should develop in children a scientific attitude. The development of this attitude resembles the development of problem solving ability in that teachers must do something about it. The mere practice of having pupils work with science apparatus, read good reference books and carry out many other activities does not guarantee the development of a scientific attitude. Children must be taught to continually ask themselves such questions as, "Do we know that?", "What proof have we?", "What do other books say about it?", "Should we try another experiment?" Science classes are the best place for this attitude to be taught although there is a place for this attitude in any classroom situation. Critical thinking is an important aspect of a scientific attitude. Children should be encouraged to question the reliability of sources of information, to be ready to accept new evidence if it is based on scientific findings, to realize there are no final conclusions in science. Developing a scientific attitude will provide many excellent opportunities for children to examine common superstitions and misconceptions. The finding of contradictory statements in books may help children develop a scientific attitude—they realize there are differences among authorities. This should lead to the checking of the authority of sources.

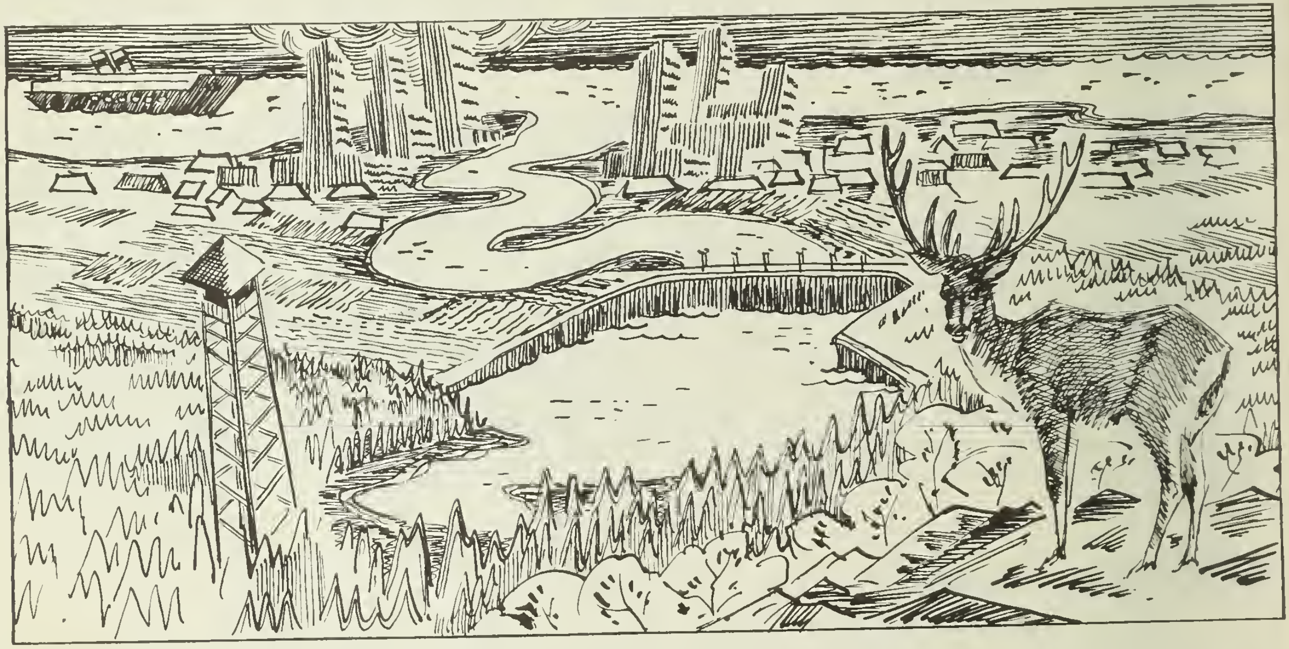
INTEREST AND APPRECIATION

Science should also create in children an interest in and appreciation of the world in which they live. The world is so full of wonders. The brilliance of the sunset, the green leaf manufacturing plant, the earth's water supply with its never-ending cycle, and the beauty that surrounds us must surely cause children to pause and wonder. The appreciation of these marvels is a very personal matter which each person acquires in his own way. This appreciation is not developed through lecturing but rather by giving each child an opportunity to discover, to see, to feel, to experience. Through satisfying experiences each child can develop for himself an appreciation appropriate to his own personality.

STORE OF KNOWLEDGE

We expect the science program to provide pupils with an ever-increasing store of scientific knowledge. This involves the principle of expanding concepts. Children come to school with much first-hand experience in the world of science. Their science experience in school should come from the world in which they live and should be continually expanding from year to year through Grades 1 to 12. Not everything concerning a phenomenon can be taught at any one time. Children's readiness and interests do not develop in such a way as to make that practicable. If children say, "We studied about the sun last year; we know all that", teachers should find out what concepts they have developed and proceed from there.

In conclusion the teacher should remember continually to ask himself these questions: "In what way is this science experience contributing to the development of these children? What is my objective?"



CONSERVATION

It is important for Canadians to consider that Canada is now one of the last areas in the world containing untouched resources. Already we need to plan for the future.

Conservation touches not only the ability of people to live well; it touches their ability to live at all. Conservation and wise development of our resources could preserve world peace.[1] We must learn from the experience of China, India, the Holy Land and Africa where there are hundreds of miles of bare, eroded hills on which once grew dense forests and abundant crops. We can learn much from the good management of many European countries such as Britain, Holland and Scandinavia. We must take care of the soil, manage our forests scientifically, conserve our water supply, husband our minerals and so ensure good living through wise use of our resources.

CONSERVATION TEACHING

Conservation is a science and as such requires the help of both specialist and educator to make it succeed. Conservation also is a way of life. It should be a spirit which prevades all the areas of study rather than be a new subject for instruction. Thus our problem is to find ways in which favorable attitudes toward conservation may be developed. The correct attitude follows understanding. Understanding comes through a science course in which there is opportunity to observe much.

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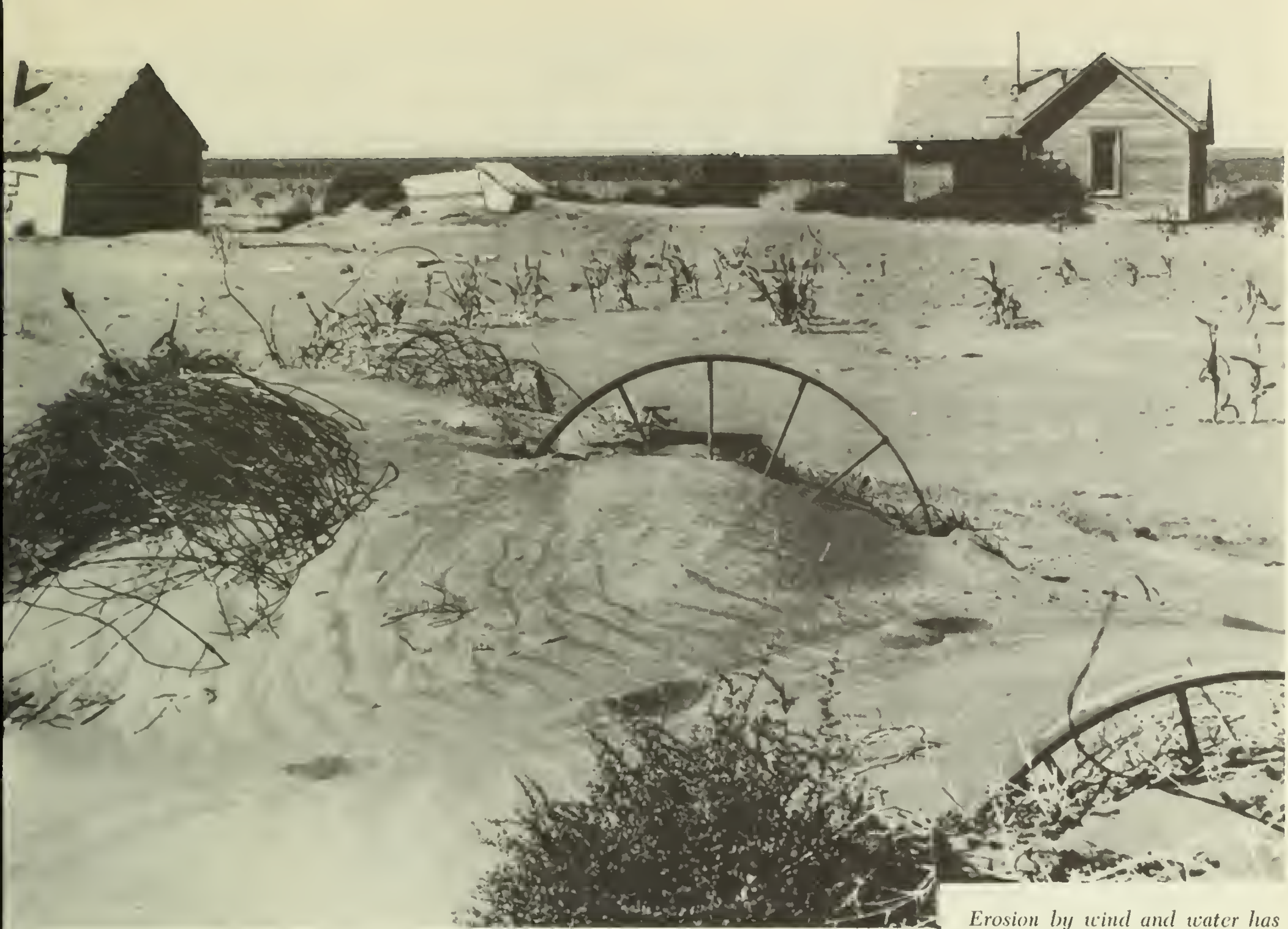
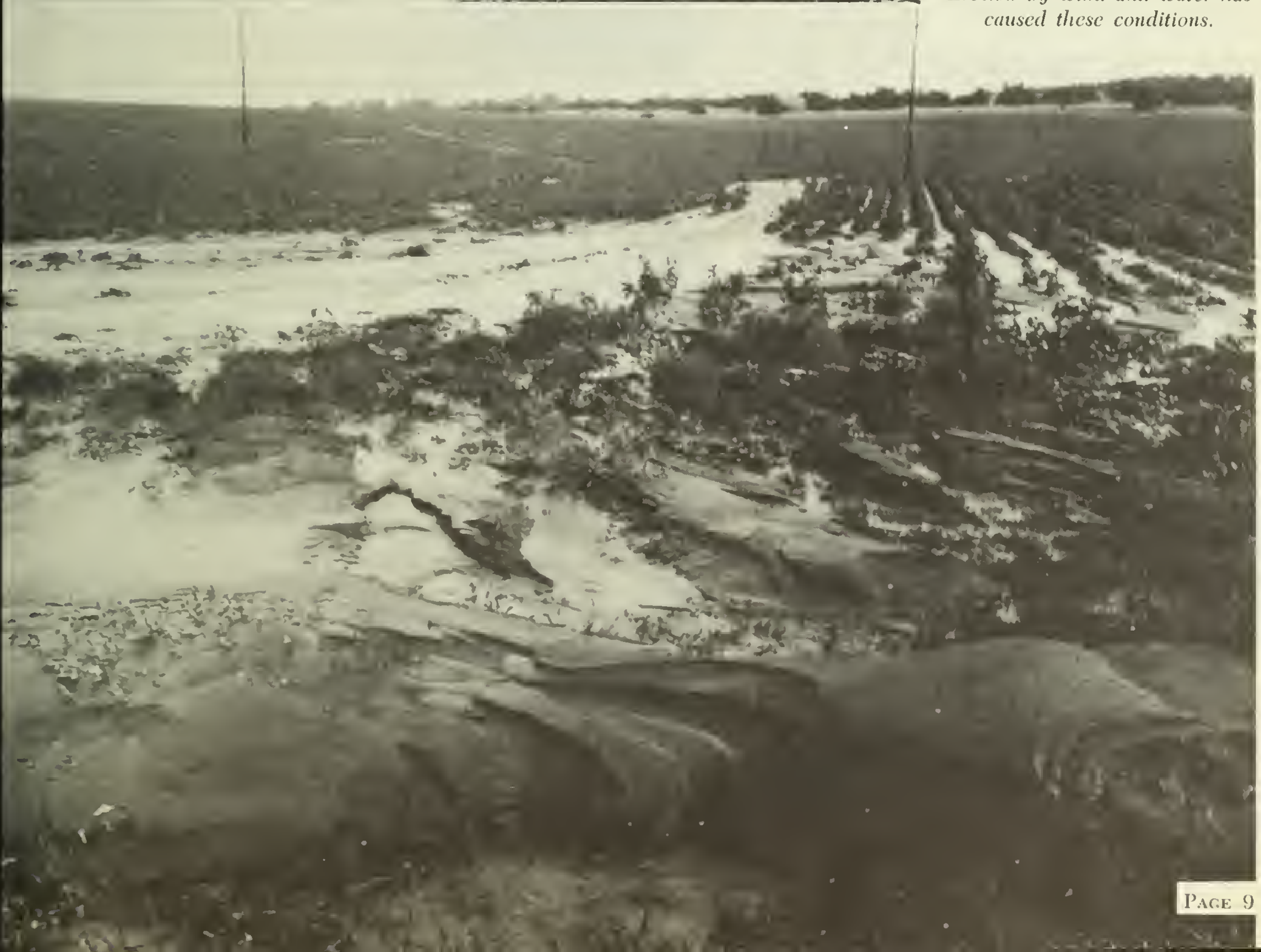
[1] J. A. Krug: *"Resources Development for the World."*



Erosion by wind and water has caused these conditions.



There are a number of very worthwhile concepts which the teacher can develop with elementary children. Among these are the following:

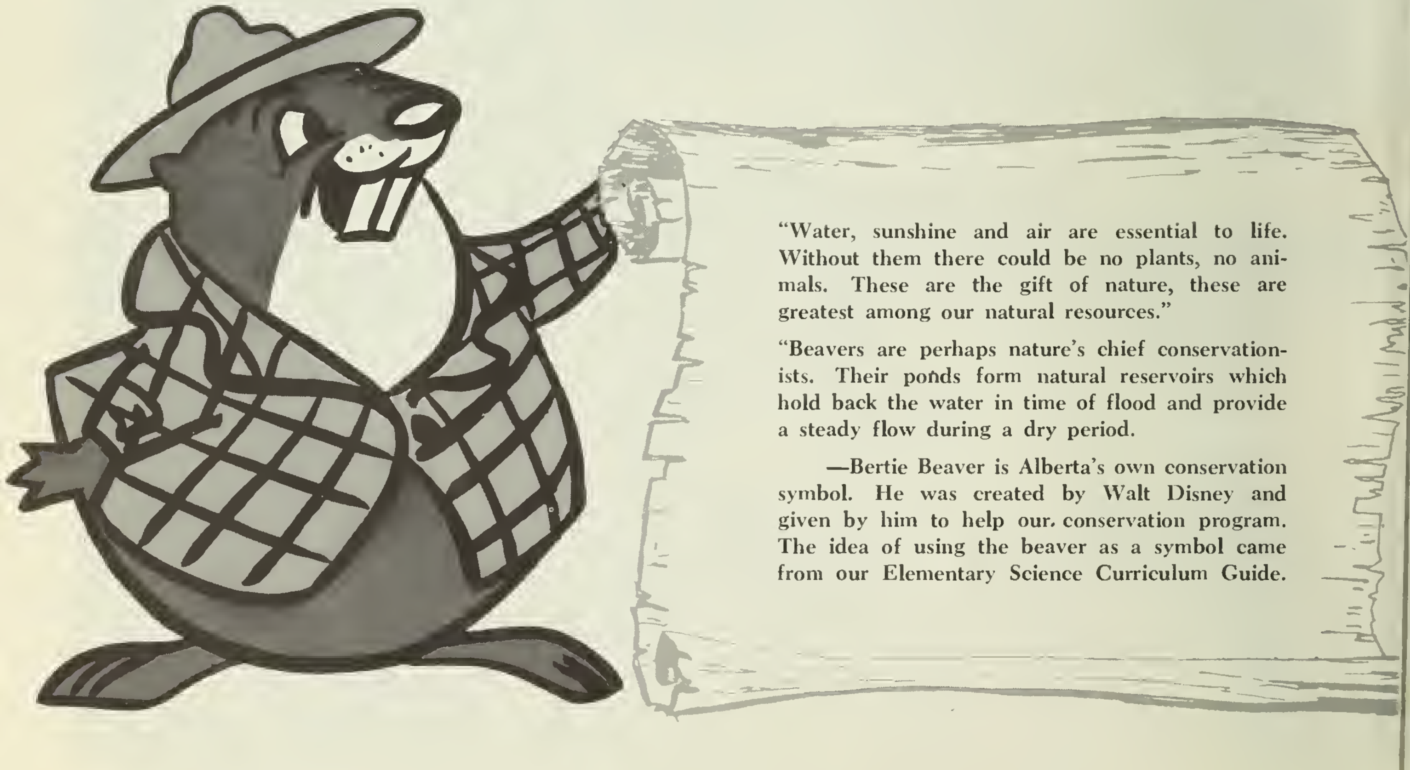
1. An appreciation of man's dependence upon natural resources.
2. Selfishness and ignorance can destroy our natural resources.
3. Wise use of natural resources guarantees continual use and enjoyment of them.
4. Careful planning can improve our natural resources.

There are a number of things to remember in teaching conservation:

(1) The word conservation need not be over emphasized. As in citizenship we do not preach the term.
(2) Many colorful teaching aids should be employed.
(3) In considering learning experiences remember that pupils should participate as well as observe.
(4) Deal continually with the environment at hand. A constant survey should be made by the teacher to see where local problems present a learning situation for the child.
(5) Finally adopt throughout a positive rather than a negative attitude toward conservation if the effect is to be beneficial.

THE CONSERVATION PLEDGE

"I give my pledge as a Canadian to defend from waste, to work for wise use and good management of my country's natural resources—its soil and minerals, its forests, waters and wild life."



"Water, sunshine and air are essential to life. Without them there could be no plants, no animals. These are the gift of nature, these are greatest among our natural resources."

"Beavers are perhaps nature's chief conservationists. Their ponds form natural reservoirs which hold back the water in time of flood and provide a steady flow during a dry period.

—Bertie Beaver is Alberta's own conservation symbol. He was created by Walt Disney and given by him to help our conservation program. The idea of using the beaver as a symbol came from our Elementary Science Curriculum Guide.

Approaches to the Teaching of Science

In the present instructional practice, there seem to be three approaches to the teaching of science: the integrated, the parallel activity and the incidental. No one of these can be considered the only approach: each has a place and serves as a complement to the other.

STORAGE
LAND
WATER SEEKS ITS OWN LEVEL
SCIENTIFIC PRINCIPLES IN IRRIGATION

Science has been integrated into an enterprise on ancient Egypt.

This experiment in electricity is being conducted as a complete science unit.

The integrated approach assumes that the major science learnings can be taught as part of the enterprise. This method allows for the development of a better understanding of relationships by the pupil. He becomes more aware of how science affects his home, his community, and his environment. Many enterprises lend themselves well to the inclusion of science learnings. There is no purpose in including science in the enterprise merely for the sake of being able to say it has been included. The survey conducted in our schools indicated that many teachers experience difficulty in integrating naturally as much science with the enterprise as they think children should have. It is one purpose of this bulletin to give guidance to teachers—as indicated in the grade outlines—with respect to where the science can be best integrated or where some other approach may be necessary.

The parallel activity approach refers to teaching science as a subject in its own right. Either it appears as such on the timetable or it is labelled a parallel activity. Regardless of the name by which it has been known it appears to have served a very useful purpose. It was here that teachers taught the parts of the science program which they found it impossible to integrate with the enterprise. If all science teaching were done by this method at the elementary level, many opportunities for children to learn how science is an integral part of all living would be lost. The sections of the science program covered by this approach may be taught informally, or as an enterprise or as a teaching unit.

The incidental approach is a common method in many classrooms. At Division I level it is sometimes called "show and tell" and is used by teachers in varying degrees. If a child brings into the classroom any object such as a rock, feather or flower, or if he can relate an interesting experience then instruction is given about the object or experience. Effective instruction cannot be carried out if it is based entirely on daily happenings. On the other hand plans may be modified because of the special interest caused by a hail storm, a flock of

OH! THAT'S IT!

The alert classroom teacher will discover many individual pupil interests which can be developed and encouraged. This girl's interest in fossils led to profitable "incidental" lessons on this topic.

geese going north or the reason for leaves changing color. It is possible to utilize the unexpected without giving up the over-all plan for a certain period of the year. The incidental approach does much more than discuss and build science concepts regarding things brought into the classroom. If this approach is to be really useful the teacher must be aware that the world of physical science is either visible from, or a part of the classroom. We need to go little further to give the students an understanding of the nature of the world. Inertia, friction, gravity are forces with which the students deal each day. The light from the sun and reflection of light can be observed in every classroom. Air, the nature of air, its expansion, its contraction can be studied as we observe the ventilation system of a classroom. The list of science concepts which can be related to the experiences and observations of students in a classroom can be extended indefinitely.

An understanding of the nature of our world for an elementary school student does not depend upon a laboratory filled with shining equipment. It does depend upon a teacher who will take the time to explore and relate the experiences and observations of the students to the world of science. If the teacher encourages the pupils to investigate their environment, to relate experiences and bring in specimens, a very meaningful type of science program can grow easily and naturally. This approach can be used extensively in exploring the local environment. The sharing of such experiences is highly motivating and should be the basis of many worthwhile science learnings.

Teachers should strive to integrate science with the social studies in the enterprise. However, a blending of the three approaches will give a well-rounded program.

The Teacher and the Elementary Science Program

THE IMPORTANCE OF THE TEACHER

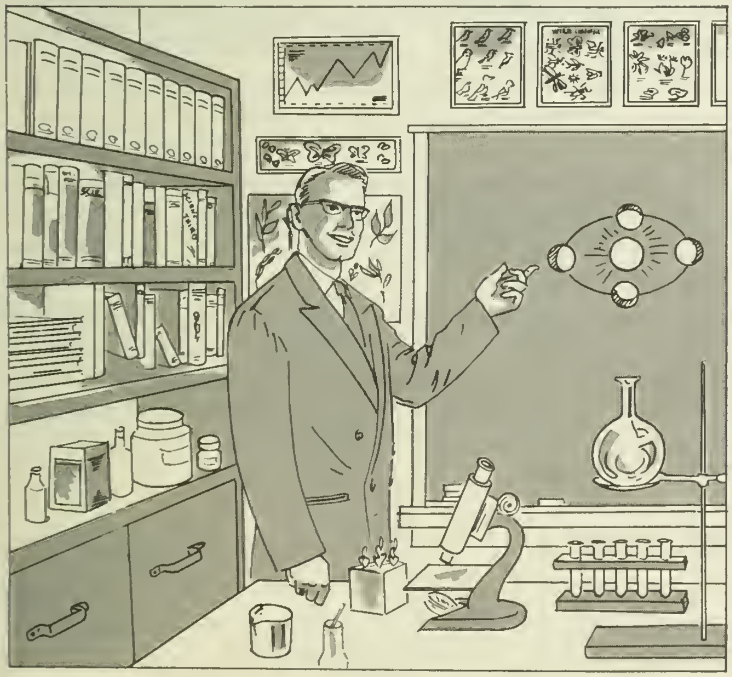
The teacher, more than any other factor, determines the quality and effectiveness of instruction. This is equally as true in the teaching of science as in the teaching of any other school subject. It is unfortunate that some elementary teachers are so hestitant to use science as a vital and stimulating part of the elementary school program.

Research indicates that many of the questions children ask are of a scientific nature. Many of the subject fields studied in elementary school—social studies, health and arithmetic—have scientific aspects. In school, at home or on vacation children cannot escape the influence of science or avoid seeing its manifestations. Ours is a scientific age and science should enjoy an important place in the elementary school curriculum.

In the recent survey in Alberta and in other surveys conducted in United States, teachers list many reasons for a feeling of inadequacy in teaching science: lack of training, unsatisfactory courses of study, lack of encouragement from administrators, fear of reaction of parents, lack of time, equipment or facilities, and many others. It is hoped that this bulletin will help teachers realize that elementary science can be a stimulating and rewarding experience for teacher and pupils and that many of the so-called obstacles really do not exist.

WHAT ARE THE OBJECTIVES OF SCIENCE IN ELEMENTARY SCHOOL?

Let us start by asking ourselves this question, "What is Science?" At the risk of over-simplification, let us say science is a method of discovering new facts and seeing new relationships, solving problems, satisfying curiosity, exploring, finding answers, as the child comes in contact with an ever broadening environment. As the child proceeds through elementary school, science should help him:



(1) know some generalizations or science principles (big meanings) that he can use in solving problems in his environment,

(2) grow in ability to solve problems effectively,

(3) develop a scientific attitude and think critically,

(4) develop an interest in and appreciation for the world in which he lives,

(5) build an ever-increasing store of useful scientific knowledge.

These objectives are simple and attainable in any classroom. It does not require a human encyclopedia of scientific knowledge to direct the experiences of children to help them grow toward realization of these objectives.

THE TEACHER'S JOB

There are many things in the teacher's favor as she approaches science teaching, regardless of her own background in the subject. Remember, almost all girls and boys like science. When they first come to school they have probably had more first hand experience with the world of science than with any other subject field in the curriculum. The local environment is always present with a wealth of natural phenomena, waiting to be explored. Every community has specially qualified people, district agriculturists, engineers, bird watchers, etc., who are usually willing to help. There is an abundance of excellent literature on elementary science and how to teach it. Most of the equipment needed is readily obtainable, experiments are simple and require little manipulation. Audio-visual aids —particularly filmstrips—for this subject are very numerous. Teachers do not need to know all the answers. Pupils will not think any less of the teacher if she says " I do not know" if they and the teacher proceed to see if an answer can be found.

Teachers should keep science in the elementary school simple. Children should be given as much opportunity as possible to handle, to manipulate, to try things, to read to find answers, to explore. Children will learn much from growing things, caring for pets, watching experiments and doing things that have real meaning to them. The readiness of children for the science program at any grade level is something of which teachers need to be aware. The developmental characteristics of each age group have important implications for the teacher of science. The urge for constant physical activity in Grade I suggests caring for plants, caring for fish in an aquarium, and going on short, well-planned field trips. Uneven muscular development at this same age suggests manipulation of large things, such as building inclined planes out of large blocks. Space does not permit a detailed treatment of this topic here but similar information is available for all grade levels. Teachers are reminded of the need for knowing the background and range of previous experiences of the pupils in order to suit the program to their needs and abilities.

The teacher's most important contribution to the children's growth through science will be her own scientific attitude. If she encourages participation and experimentation, varies the activities and approach to the subject she is developing the valuable concept that "we do science" not "learn about science." If her teaching is frequently punctuated with such phrases as "Let us find out", "I wonder what will happen", "Do we know that?", "How do we know?", "Why did that happen?" and steps are taken to find out, the teacher is giving her pupils some valuable leadership in elementary science. On the other hand, if the teacher supplies all the answers and gives the impression that these are the last word and final authority, without helping the children to find their own answers, the major objectives of elementary science cannot be realized.

EVALUATION PROCEDURES

Evaluation is the means by which we measure how well we are accomplishing what we are attempting to do. As mentioned in the statement of objectives for elementary science earlier in this outline, there has been an undue amount of emphasis on subject matter as an end in itself. This emphasis has led us to believe that evaluation and testing for knowledge of facts are one and the same process. In terms of the objectives of the elementary science program testing for information will constitute only one phase of evaluation. Evaluation is an on-going process while testing is something done at the end of a given area of study. Evaluation concerns itself with many aspects while testing is very limited in its scope. The objectives of the program as stated previously are implicit in the evaluation process. (A comprehensive statement of criteria for evaluation appears on pages 3 - 5 of Promotion Policies Report, Department of Education, Edmonton, Alberta.)

THE TEACHER EVALUATES THE PUPILS

Many phases of growth in the pupils can be best detected by observation. Over a period of time the teacher will see definite signs of changed attitudes, improved abilities and greater skills. The teacher will realize the science program is bringing results when the pupils show increased ability to:

(1) plan experiments carefully

(2) accept only proven ideas

(3) realize there is a cause for every effect

(4) withhold judgement until sufficient evidence has been procured

(5) change their minds in the face of new evidence

(6) go to reliable sources for information and evidence

(7) respect the point of view of others

(8) think critically

(9) be accurate in observations

(10) interpret science phenomena in their environment

THE TEACHER EVALUATES HERSELF

Self-evaluation in teaching is essential when we realize that the curriculum depends on what happens when the teacher actually works with children in the classroom. Specific lessons can be evaluated by reference to a set of criteria such as suggested below:

(1) Did I plan adequately?

(2) To what extent did I realize the objectives of this lesson?

(3) Was the material I used suitable for this grade level?

(4) Was there sustained pupil interest?

(5) Was there active participation?

(6) Did I recognize individual needs of pupils?

(7) Were pupils challenged to think?

(8) Were they given time to think?

SCIENCE IN YOUR CLASSROOM

Another means of self evaluation by the teacher is to assess her own attitude and approach to the science program in her classroom. The following ten guide questions will serve as one set of criteria which might be used.

Do you . . .

1. Read the literature in elementary science? There is no substitute for knowing what the best teachers of science are thinking and doing.
2. Make use of the suggestions in the manuals and teachers' editions which accompany the science readers?
3. Foster the idea of "Let's find out" by directing the observations of the students and planning experiments with the students?
4. Evaluate your efforts regularly with tests, by keeping anecdotal records of committee work, of experiments and of field trips?
5. Participate in workshops and study groups in science?
6. Use instructional material available in your library and in your community?
7. Use your knowledge of children's growth patterns in planning the program?
8. Use the facts and information that your students have gathered to build science generalizations?
9. Take the pupils on well-planned field trips?

THE TEACHER AND PRINCIPAL EVALUATE THE SCHOOL PROGRAM

Repeated reference has been made in this bulletin to the importance of each school using the resources of the community in the elementary science program. Regular evaluation of this phase of the program by the principal and his staff will guarantee improved results.

1. Have we discussed the objectives of science at a staff meeting lately?
2. Have we developed adequate evaluation procedures?
3. Are we aware of the varying interests, abilities and state of readiness of the pupils in our schools—rural, town, city?
4. Are we willing to learn with the children, explore new things with them and help them to identify new objects?
5. Are there definite signs of increased pupil interest and understanding in the field of science?

Resources for Teaching Science Are All Around You.

Have you tried . . .

1. Going out of doors with your class to observe the various animal adaptations and vegetation changes at the different seasons of the year?
2. Having members of your class interview the district agriculturist, a local doctor or nurse, an engineer, a bird watcher, the owner of a dog kennel, or other persons who may have some specialized knowledge about the material being studied in your science program?
3. Visiting the scene of a recent fire, flood, drought, or hailstorm to help your class better understand their consequences?
4. Raising a pet, planting a garden, or maintaining a bird feeding station in or near your classroom?
5. Taking your class on a tour of a coal mine, oil refinery, lumber mill, packing plant, or other industries in the community?
6. Holding an evening session with your class to study the stars and other heavenly bodies?
7. Paying a visit to the local weather office, radio or T.V. station, airport, railroad yards, or the like?
8. Interesting your class in collecting fossils by visiting suitable formations where they occur in your community?
9. Having your class visit a fish hatchery, farm, power dam, irrigation project or other places where conservation measures are being practiced?
10. Planning a field trip to study the plants, flowers, birds, animals or insects of the area in their natural surroundings?
11. Letting your class visit the scene of pest or insect damage?
12. Asking the school principal or caretaker to explain the school heating or lighting system, the fire extinguishers, the audio-visual equipment, or other school equipment to your class to illustrate and reinforce your science teaching?
13. Having your class examine and list those things in their home environments which illustrate the application of their school science learnings?

The Principal and the Science Program

The principal occupies a key position in improving the science instruction in the school. He has the opportunity of supplying the necessary leadership to help make science a vital and stimulating part of the elementary school program.

Action Suggestions

1. Encourage teachers to study at staff, grade, or committee meetings, the objectives and methodology of their science program.
2. Arrange for a survey of commercial materials and local community resources that can be utilized in the science program.
3. Interest the staff in developing science resource units at various grade levels.
4. Organize the intervisitation of teachers to observe the science program in action and to emphasize the need for articulation and continuity of instruction from teacher to teacher, grade to grade, and school to school.
5. Establish a school-wide system for evaluating and grading pupil growth in science.
6. Stimulate staff study of professional books, magazines, and journals related to science instruction.
7. Request funds for the purchase of science books and pictorial materials for addition to the school or classroom library.
8. Have a teacher demonstrate to the staff the effective use of science materials as these are secured for the school.
9. Coordinate field trips to insure that these occur when they are most beneficial to the pupils and are not duplicated.

Developing the Science Program

EXPERIMENTING

Keep Experiments Simple

Experimenting holds a great interest for children of all ages. The thrill children get from "trying out", "finding what happens" is an excellent interest on which teachers should capitalize. In elementary school, experiments should be simple. If elementary teachers use high school methods of approach and expect written reports containing five or six detailed steps in experiments carried out by elementary pupils, disappointment is almost certain to follow. In the early stages of experimenting in the elementary school where the experience is a new one to the pupils it is sufficient to say "Let us see what happens". Later on the teacher can expand procedure to two headings, the purpose of the experiment and directions as to how the experiment will be done. If the approach to experimenting is gradually made more detailed, by the time children leave elementary school, a good working knowledge of the process should be a part of their science understanding.

Make Pupils Think

Science experiments should be performed in such a way as to cause pupils to think. If the teacher has already told the pupils the answer it is not necessary to perform the experiment. Experiments require careful planning with the children sharing as much of the planning as possible. Pupils should not be allowed to make sweeping generalizations as the result of the findings of one experiment. The purpose of the experiment should be to help children to understand an idea or answer a question. However, it must not stop there. The experiment should have been chosen so that the children may apply the findings to similar situations in the world about them. This application to real-life situations determines if the experiment has any meaning to the children.

Let the Children Do Experiments

The great majority of experiments conducted in the elementary school should be sufficiently simple and safe that the children can perform them. If classes are large, experiments can be performed in small groups. It is well to remember that watching an experiment done is quite a different type of experience from actually doing it. Children should be encouraged to plan their own experiments. This will give opportunity for careful planning and organizing, as well as scientific thinking. Long range experiments have a place in the elementary school. Caring for pets, growing plants, observing changes over long periods of time give children experience with different but very important types of experiment. Children should not be permitted to do experiments aimlessly and without purpose. They should always know what they are doing and why they are doing it. They must have a purpose.

Written Records

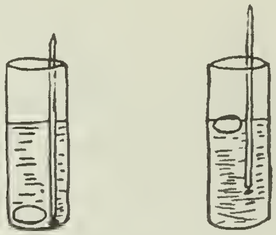
It is neither necessary nor desirable to have children make complete formal records of experiments they perform. In Division I too great an emphasis on written records will detract from the natural interest children have in experimenting. There should be a steady growth in the completeness of written records from a very simple two or three-sentence report to a reasonably complete type of statement by the end of Grade VI. If experiments take longer periods of time to perform, children should learn the desirability of regular observations and brief notes to record them. Drawings can be used to good advantage in recording experiments. Keep them simple.

Science Experiment

Problem: Why can we swim and float easier in salt water than in fresh water?

Materials We use: Two glasses of water, salt, egg, a pencil with a thumb tack.

What we did: We filled both glasses with water. In one we added salt. We put the egg and the pencil with a thumb tack into the fresh water. We placed a mark where each came to rest. Then we placed the egg and the pencil in the glass of salt water.



What we observed: In the salt water the egg floated to the top. The pencil floated higher.

What I learned: Things float easier in salt water. It should be easier to learn to swim in the ocean.

Division II pupils should be encouraged to make written records of their experiments. This Grade V report indicates how the pupil has recorded the experiment in his own words.

Experimenting is only one way of learning in science. It is important but its potentialities will be realized only if it is used in terms of supplying answers to questions and problems of children as they see them in their environment. Experimenting can make work in science more interesting, more meaningful, and can provide plenty of opportunity for thinking, reasoning, planning and observing.

Reference Books and Science Readers

Reading to find the answers is a necessary part of any good elementary science program. Children cannot learn everything by first-hand experiences. Children can learn much from reading science readers, reference books, magazines, etc. The one prime danger is that science may degenerate into a textbook course. With care this danger can be avoided if the teacher will observe the following precautions:

(a) Know what information can be obtained from the books.

(b) Direct the reading of the class to locate answers to questions.

(c) Make sure that no one book is used as a text.

Reading may either follow an experiment to check results or may suggest an experiment to see something first-hand. Reading should preferably be done from a number of sources rather than from one. Science is an excellent place to have pupils experience reading for information. Supplementary books in science may be used by some individuals as reading for pleasure. Reading is a necessary tool in the elementary science program.

The following series are the authorized texts for Elementary Science:

	EXPLORING SCIENCE (Macmillan Co.)	SCIENCE TODAY AND TOMORROW (Ginn & Co.)	BASIC STUDIES IN SCIENCE (Gage & Co.)
Grade 3	Exploring Science Three	Science Everywhere	How Do We Know?
Grade 4	Exploring Science Four	Discovering With Science	Discovering Our World 1
Grade 5	Exploring Science Five	Adventuring in Science	Discovering Our World 2
Grade 6	Exploring Science Six	Experimenting in Science	Discovering Our World 3

For the Grades I and II these series are recommended as references:

	EXPLORING SCIENCE (Macmillan Co.)	SCIENCE TODAY AND TOMORROW (Ginn & Co.)	BASIC STUDIES IN SCIENCE (Gage & Co.)
Grade 1	Exploring Science One	Science Near You	Look and Learn
Grade 2	Exploring Science Two	Science Around You	All Around Us

Note: Sections of both the Enterprise Lists and Reading for Pleasure Lists from the School-Book Branch have parts devoted to enrichment reading for more advanced pupils.

OBSERVING

As children are required to observe more carefully and to report and to interpret more scientifically, they are developing necessary abilities for further study and for participation in adult society. The importance of observation has been emphasized in the section which discusses experimenting. The need for careful observation becomes apparent as we study the local environment. As pupils are taught to be better observers, to learn to use their senses of seeing, hearing, smelling, touching and feeling, the local environment will become a stimulating and interesting source of information. Each season brings with it a wealth of natural phenomena which children must be taught to see so that the effectiveness of field trips, experiments, and visual aids will be increased. Careful, accurate observing must be one of the results of a good science program.

FIELD TRIPS

In every community there are places to see and explore that will add meaning to the science program. Field trips to these places should help pupils to gain information, solve problems and develop appreciations. These desirable benefits do not necessarily follow because a group of children and a teacher take a field trip. A poorly planned trip can and often does result in disappointment for the teacher, a "holiday" for the children and bad public relations for the school.

The following points will serve as guide posts for any field trip:

1. Check administrative regulations covering field trips in your school system, e.g. necessary permission, provision for students not participating, use of buses, etc.
2. Be certain that the teacher and pupils have a real reason for making the trip. They should go to answer questions that are best settled by first-hand observation.
3. Pre-plan cooperatively for safety, transportation, sufficient adult assistance, a guide where necessary, time schedule and note taking.
4. Either the teacher, or the teacher and a committee of pupils should make a preliminary trip to make certain that the objectives of the trip can be achieved. In other words, make sure that what you are going to see is really there and that you can find it.
5. The importance of courtesy and conduct on such a trip should be discussed and a set of behavior standards agreed upon.
6. Any trip should be a part of school work that is presently in progress and not an unrelated venture.
7. Individuals and small groups might be delegated to watch or listen for certain things and report them to the class.
8. Follow-up discussions, reports and records are essential for maximum results.
9. Last but not least, application of the information to specific problems is the final step in the process.

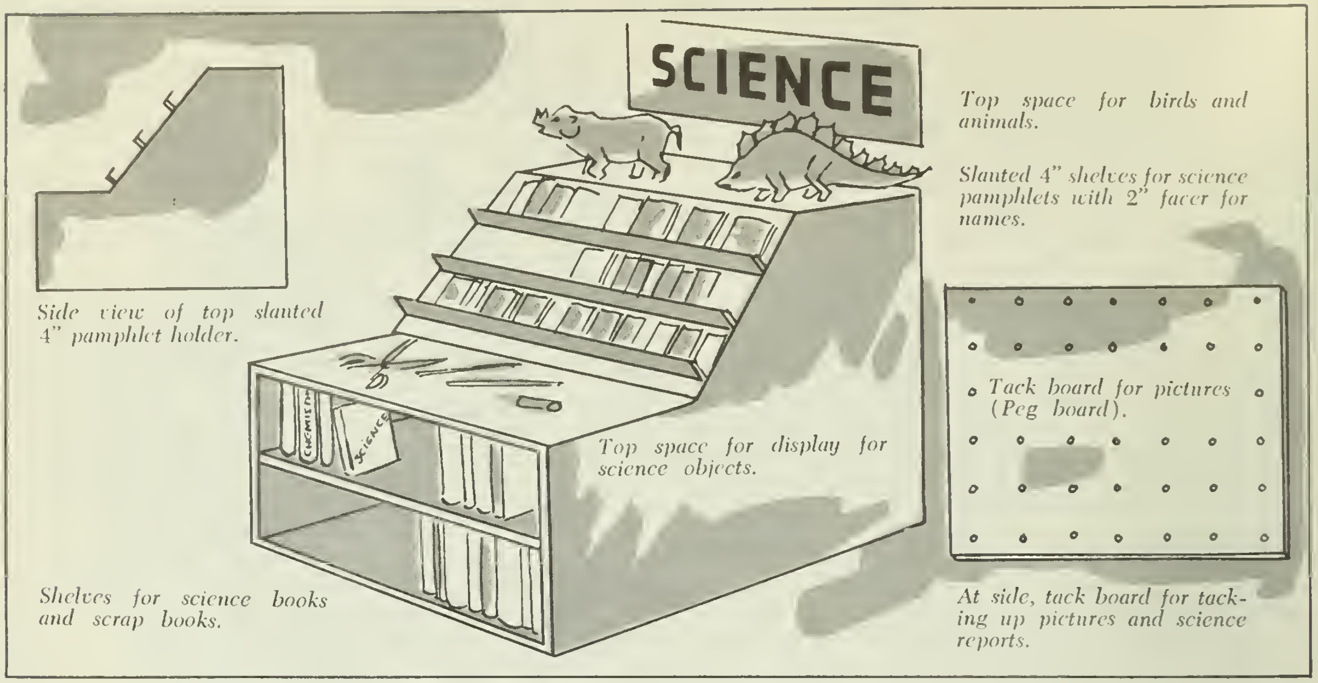
THE SCIENCE CORNER

A well-organized science corner is necessary to teach elementary science. It can become the motivating force necessary to originate and sustain activities in reading, language, arithmetic and social studies as well as the science-health areas. It becomes an interest center where pupils may examine collected items, find related reference material, conduct simple experiments or observe the wonder of an aquarium or terrarium. The science corner not only satisfies individual interests, it also contributes to good group living. The establishment of such an interest center calls for co-operation in the planning and execution of any project. Responsibility certainly must be an outcome of its maintenance. Things of nature appeal to all children.

The science corner may vary greatly from room to room and from school to school. A lowly orange crate or an empty desk will serve as a display and storage space if necessary. Location away from assembly areas and near a light source is advisable. A nearby wall is necessary as a tack board base. When the location of the science area becomes a class problem the cooperative solution should result in a sense of ownership. As it grows in size the busy teacher will find the class capable of providing suggestions for expansion.

A printed card should designate the agreed location. Any flat surface will serve to support a beginning, collection of rocks, plants or shells. The end of a work table may be reserved for the display of collections or science projects. Shelves or drawers are useful for the storage of equipment used in science demonstrations or experiments. A tack board is a necessity for the display of printed matter related to the project in hand. An aquarium or terrarium provides a center of interest which may lead to the development of many nature study units. A simple filing system is essential if the various pieces of information are to be readily available. The science reference library should be located nearby and a number of chairs supplied for pupils to sit down while they read, and to observe an experiment.

The science corner is more than a visual aid. It is a library, a laboratory, a museum and a workshop. It is dynamic, changing with the seasons and the interests of the pupils. It results in enthusiastic pupil participation in practical experience in problem-solving, and is a source of motivation.



Top space for birds and animals.

Slanted 4" shelves for science pamphlets with 2" facer for names.

Side view of top slanted 4" pamphlet holder.

Tack board for pictures (Peg board).

Top space for display for science objects.

Shelves for science books and scrap books.

At side, tack board for tacking up pictures and science reports.

AUDIO-VISUAL AIDS

There are many audio-visual aids available to assist in the teaching of science. They include filmstrips, moving pictures, still pictures, diagrams and models. They can be used to assist but never replace the teacher. They will contribute as the teacher explains them, as the pupils examine and discuss them and as they encourage further study. Audio-visual material should be chosen carefully as should any instructional aid. They need to be evaluated regularly in terms of what they are expected to accomplish.

The selection of audio-visual materials should be made with due regard for such factors as purpose, attractiveness, accuracy, use and cost. Materials should be applicable to the science program. Once they have been acquired they must be taught, not merely displayed. It is preferable to use them in the regular classroom situation as an integral part of teaching procedures. If used to excess, much of their effectiveness is lost.

The following steps in using audio-visual aids should improve their effectiveness:

(a) Select the material on the basis of a real need.

(b) The teacher should become thoroughly familiar with the material. It should always be previewed at least once.

(c) Make certain the children know what questions the material is expected to answer. It is essential that the children are prepared for what they should expect.

(d) Use the material as it seems to best meet the needs of your class.

(e) Have a definite follow-up. Most of the possible value is lost if this is not done.

(f) Re-teach the material if pupils seem to have a need for it.

(g) Evaluate the effectiveness of the material.

SCIENCE MATERIAL AND EQUIPMENT

The problem of obtaining apparatus and other material for use in demonstrations and experiments in science in the elementary school is not nearly so difficult to solve as many teachers believe. It is not necessary to spend a large amount of money for expensive apparatus. Most science experiments in the elementary grades are simple and the materials should also be kept simple. Home-made equipment often serves the purpose as well as, or better than, more elaborate purchased equipment.

The materials to be used in the science program surround us, always in sufficient amount, and usually in great abundance. The wealth of natural objects and phenomena, animate an inanimate, the multitude of articles manufactured and used by man, and the laws and principles that govern the operation of every sort all have a contribution to make to the science program.

The following list of materials is considered to be about the minimum number of items necessary to teach elementary school science. The list is for the purpose of assisting teachers in assembling the essential equipment for establishing a science program. It is divided into two parts:

(1) Obtainable from Scientific Supply Houses (2) Obtainable from Local Sources

1. *Obtainable from Scientific Supply Houses*

Recommended Quantities	Description
1	Alcohol Lamp, glass, 4 oz.
3	Beakers, Pyrex 250 c.c. @ 50c
3	Beakers, Pyrex 400 c.c. @ 60c
12	Test Tubes, 7 x 7/8, per doz.
1	Battery Jar, 5 x 7
2	Dry Battery @ 95c
2	Flask, Erlenmeyer, 500 c.c. @ 85c
1	Funnel, glass, 75 m.m.
1 lb.	Tubing, glass 5 m.m.
4	Rubber Stoppers, Solid No. 2 @ 5c
2	Rubber Stoppers, 1 hole No. 2 @ 5c
4	Rubber Stoppers, Solid No. 5 @ 10c
2	Rubber Stoppers, 1 hole No. 5 @ 10c
2	Rubber Stoppers, 2 hole No. 5 @ 10c
2	Rubber Stoppers, Solid No. 7 @ 13c
2	Rubber Stoppers,1 hole No. 7 @ 13c
4 ft.	Rubber tubing ¼" inside diameter @ 25c per ft.
1	Supports, for test tubes, of wood, single deck, with 12 drying pins
2	Clamp, nickled spring wire @ 20c
1	Support, iron base and rings, 3", 4" and 5" complete
1	Wire gauze, galvanized, plain, 5"
20 ft.	Wire, annuciator, copper No. 18 @ 10 ft. for 10c
1	Magnet, Bar 6" x ½" x ¼"
1	Magnet, U
1	Compass, small
1	Prism, glass 60°, 3"
1	Lens, Convex
1	Lens, Concave
1	Tuning Fork, C1
1 lb.	Iron filings
1	Osmosis Apparatus, thistle tube (double) with membrane
1	Litmus, Red (100 strip)
1	Litmus, Blue (100 strip)

2. *Obtainable from Local Sources*

(a) Living Things

1. Fish, snails, water plants, etc., for aquarium
2. Turtle, frog, salamander for terrarium
3. Seeds (bean, corn, etc.)
4. Growing Plants (geranium, begonia, ivy, bulbs, cactus, mushrooms, etc.)
5. Algae, larvae of different kinds

(b) Glassware

1. Fruit jars
2. Milk bottles (and caps)
3. Glass tumblers
4. Lamp chimneys
5. Reading glass
6. Small mirrors
7. Window glass (4" or 6" squares)
8. Pyrex nursing bottles
9. Compass

(c) Construction Materials

1. Jars containing assorted nails, tacks, paper clips, screws, elastic bands, etc.
2. Hammer, pliers, file, screw driver, knife
3. Glue, paste, shellac
4. Sandpaper
5. String and cord
6. Small tins of paint and varnish
7. Adhesive tape
8. Single and double pulley, electric bell, copper battery element, pith balls (set of 6 with silk cord)

(d) Chemicals

1. Soda
2. Starch
3. Sugar
4. Lime (Slaked)
5. Red Ink
6. Vinegar
7. Table salt
8. Paraffin
9. Ammonia
10. Iodine
11. Dry Ice

(e) **Collections**

1. Seeds
2. Leaves
3. Shells
4. Bird nests
5. Local rocks, minerals, etc.
6. Insects
7. Science pictures of various kinds

(f) **Miscellaneous**

1. Box of garden soil (about 2 qts.)
2. Box of sand (about 2 qts.)
3. Box of sawdust
4. Flashlight bulbs and sockets
5. Balloons
6. Medicine dropper
7. Magnets
8. Blotters
9. Animal cage (or material to construct it)
10. Paper cups
11. Bowls and flower pots
12. Pot-holder
13. Spoons of different metals
14. Old electric switches or push buttons
15. Old copper wire
16. Pulleys
17. Soda straws
18. Salt cartons
19. Toys (boats, blocks, trains, wagons, steam engine, airplanes, etc.)
20. Old bicycle pump
21. Old clothesline pulleys
22. Sponges
23. Tin can and stopper (syrup tin)
24. Mailing tubes
25. Old storage battery, and worn out dry cell
26. Cellophane (clear and colored)
27. Candles (large and small)
28. Old rubber hose (from bath spray)
29. Old light bulbs and fuses
30. Dry ice
31. Thermometer

TEACHER'S NOTES:

SCIENCE CORNER
SHELLS
ROCKS

Spring Comes To The Farm

Farm life interests all children and through such an enterprise children will develop an appreciation of the contribution the farm makes to the life of all people. Spring time seems to be a most suitable time for such an enterprise as it is then that baby chicks, calves, colts, puppies and kittens make their appearance.

Interest may be aroused through the discussion about animals, examination of pictures, and the reading of stories. A trip to a farm will be of utmost value to children from the city and town who have never been in the country. The excursion should be planned as the culmination of the activity so the children may be prepared to observe intelligently.

The enterprise may be modified for Grade I or II or Grade III.

I. TOPICS OR PROBLEM AREAS

1. Animals in Springtime
2. Birds in Springtime
3. Insects in Springtime
4. Plants in Springtime
5. Weather in Springtime

II. OBJECTIVES

A. General Objectives

1. To encourage initiative in seeking information.
2. To increase child's knowledge of world around him.
3. To increase facility in oral and written language.
4. To direct children in locating information in books.
5. To develop, observe carefully, and record observations.

B. Specific Objectives for Various Problem Areas

1. To teach a definite body of concepts about animals, birds, insects and plants such as the following:
    - (a) classification according to various characteristics
    - (b) patterns of growth
    - (c) food required for life and growth
    - (d) varying requirements or provisions for parental care and protection.
2. To teach the importance of weather to the farmer and to all people who depend on the farm
    - (a) To identify and measure manifestations of weather change: temperature, wind, moisture, etc.

III. INITIATION

1. Discuss personal experiences of children on the farm.
2. Discuss pictures of farm life.
3. Plan a simple map of a familiar farm or the route to a relative's farm.
4. Identification of animals, plants, insects, birds which would be seen on the farm.
5. Collect pictures of different kinds of weather—dark and light clouds, lightning, sunshine, trees bending, etc.
6. Look at different grain seeds and plants and learn to identify each and separate them from weed seeds.
7. Classify animal and animal products from a list.

SECTION I: ANIMALS IN SPRINGTIME

1. What animals wild or tame would we see on the farm in spring?
2. What are our animal neighbors like? See "All Around Us."
3. What food do they need?
4. How do they grow?
5. How are baby animals protected?

Activities for Section I

1. Classify animals under different headings, four feet, long legs, fur, etc.
2. On an outline map of Alberta place animals of the woods, the mountains, and the prairie.
3. Mount pictures of animals and prepare short reports.
4. See the film "Beaver Valley", A 3772-4.
5. Learn songs. CANADIAN SINGER, Bk. 2,
   p. 163, 161, 152
   SING HEIGH HO, p. 88.
6. Summarize ideas about baby animals on charts and illustrate.
7. Classify animal stories as true or fanciful fables.
8. List new words for animals, their homes, their babies.
9. Write letters asking permission to go on excursions.
10. Discuss care of animals, pets. "All Around Us," Teacher's Edition, p. 63.
11. Learn how to pluralize such nouns as cow, kitten, fox, pony, bunny, calf, hoof, mouse, etc.

References

ALL AROUND US—pp. 78-80.

EXPLORING SCIENCE II, III.

SCIENCE EVERYWHERE III.

SCIENCE AROUND YOU X.

SECTION II. BIRDS IN SPRINGTIME

Objectives

1. To learn the names of the more common Alberta birds and to be able to identify the birds.
2. To appreciate the color and music birds bring to us.
3. To understand how birds are man's helpers.
4. To extend vocabulary and meanings of words.

Activities for Section II

1. Locate and read stories and poems.
   See: I KNOW A SECRET—pp. 33-54
   OUR NEW FRIENDS—p. 121
   ON CHERRY STREET—p. 148
   THE STORY ROAD—p. 1
2. CANADIAN SINGER, Book 2—p. 168, "Little Birds' Ball." This may be taught as an action song and paper headdresses and wings added for effect.
3. Collect and mount bird pictures. Prepare short reports on each.
4. See C. Hampson's filmstrips of Alberta birds. (Curr. 600-602).
5. Add words such as beak, claw, throat, hatch, yolk, to vocabulary. Learn opposites for male, bright, young, etc.
6. Experiment with water and a feather to show that oil repels water.
7. On a map locate the nesting ground, winter homes and migration routes of common birds.

References

ALL AROUND US—pp. 11, 18, 21. Summarize learnings as on p. 87. Make a chart.

EXPLORING SCIENCE 2—pp. 145-158

SEEING WHY (Winston)—pp. 83-93

SECTION III: INSECTS IN SPRINGTIME

Study only one or two such as the grasshopper and moth, butterfly or ant.

Objectives

1. To understand something of the farmer's problems in dealing with insects.
2. To understand how birds have a retarding effect on insect increase.
3. To learn something about the life-cycle of insects.

Activities

1. Read stories about insects. ALONG THE WAY—p. 125, "The Caterpillar."
   I KNOW A SECRET—p. 138
2. Learn song. CANADIAN SINGER, Book II—p. 177 and p. 182.
3. Physical Education. Imitate a grasshopper.
4. Art. Make butterfly designs and colors.
5. Discuss harmful insects and useful insects.
6. Collect pictures and prepare individual reports.
7. Make cutout pictures of each stage of life.
8. Discuss how birds obtain various types of insects for food.

References

ALL AROUND US—p. 13

EXPLORING SCIENCE, Book II—pp. 6-13

SECTION IV: PLANTS IN SPRINGTIME

Objectives

1. To understand how plants under the snow come to life again in the warm sunshine.
2. To understand how seeds burst into life with heat and moisture.
3. To appreciate the fact that our food all comes directly or indirectly from plants.
4. To understand why some plants are considered to be weeds.

Activities

1. Plant seeds and bulbs to observe and record growth.
2. Summarize observations with illustrations.
3. Start cuttings from leaves, stems and potato "eyes."
4. Examine different seeds to see how they travel.
5. Discuss conservation of wildflowers.
6. Learn from POEMS FOR BOYS AND GIRLS, Book One, "Baby Seed Song"—p. 46, "Pussy Willows"—p. 48 and "Catkins"—p. 49.
7. Learn song. CANADIAN SINGER, Book II—p. 161.
8. Discuss how the farmer controls weeds on the farm.

References

EXPLORING SCIENCE, Book II—p. 67 and p. 72

ALL AROUND US—p. 68 and p. 73

SECTION V: WEATHER IN SPRINGTIME

Objectives

1. To understand something of the fact that the kind of weather we have affects our crops.
2. To recall the kind of weather we have in Alberta's springtime.
3. To have some fear of lightning and to take precautions.
4. To understand what causes thunder.
5. To learn wind direction.
6. To learn the use of the thermometer.

Activities

1. Visit a weather station to see thermometer, rain gauge, wind recorder, etc.
2. Discuss thunder and lightning.
3. Experiment with static electricity and discuss why you get sparks.
4. Rub a balloon with a woollen cloth and then use the balloon to pick up pieces of paper.
5. Make a storm scene on a flannel board with cutouts of clouds, lightning, rain, etc.
6. Prepare cutouts for several kinds of weather and let children arrange them for different kinds of days.
7. Discuss weather reports on TV or radio. Note terms used to describe wind such as gentle, calm, fresh, strong, gale, moderate. Keep a weather record.
8. Learn poems from POEMS FOR BOYS AND GIRLS, Book I; "Who has Seen the Wind?," "Windy Nights," "The Wind," "My Shadow."
9. Read the story, "The Wind and the Sun."

References

ALL AROUND US—p. 41

SCIENCE AROUND YOU—p. 28. Experiment about moisture.

EXPLORING SCIENCE 2, Teacher's Edition—p. 90, "Wind"

EXPLORING SCIENCE, Book III, Teacher's Edition—p. 30

CULMINATION

Completion of either of the following activities might serve as a culmination:

1. Plan to visit a farm. Write letter to ask permission and letters of thanks afterwards.
2. Have a springtime display of the following: an aquarium, growing plants, bird houses, anemometer.

Chart stories of observations, plans, and experiments.

Impersonate animals, birds, insects, using a headdress.

Exhibit useful reference books used for reports.

Write reports with pictures of living things.

ADDITIONAL REFERENCES

The Community Where You Live
Pierce & Gorgas, Allyn & Bacon, 1959

Poultry Farm, p. 46; Ranch, p. 47; Dairy Farm, p. 49

How We Live, Bell & MacDonald
Thos. Nelson, 1958

Country Life, pp. 6-23

Dairy Farming, pp. 38-42

Time for True Tales, Arbuthnot

Films

Visiting Grandma in the Country, Pk 2439

Spring in Country and Town, Pk 2249

Farm Babies and Their Mothers, Tk 1225

Janet Visits the Dairy Farms, Pk 1040

Farm Pets, Pk 2374

For More Mature Pupils

How Do We Know, Beauchamp et al
W. J. Gage
Adaptations of birds and animals for getting food, pp. 20-29

Insects, their body structure, p. 18

Plant Enemies, p. 18

How plants get food and water, p. 62

Adapted with kind permission from an Edmonton Public School Enterprise

Sound waves travel in a similar way.

		GRADE I	GRADE II	GRADE III
LIVING THINGS	(a) Animals	Environment Homes are regulated by environment. Food varies according to environment. Environment is used by men for various purposes. Animals prepare for winter in a variety of ways.	Must have food to live and grow. Young animals receive varying degrees of parental care.	Have structures that enable them to get food in many environments. Should be conserved by everybody.
	(b) Plants	Live in various places, and are used by people and animals in many ways. Plants prepare for winter in a variety of ways.	Need light and water to grow. Seeds travel in many ways.	Have roots and leaves to get food. Insects and other animals feed on plants. Man protects some plants for his own use.
THE EARTH AND THE UNIVERSE		How Weather Changes through the seasons. The things we see in the sky are sun, moon, stars and clouds. The earth is made up of of rocks, land and water. Air is all around us. We can feel it. It moves things.	What We Can Learn from the Sky. Directions can be determined from the sun, moon and stars. The moon's appearance goes through a series of changes each month. There are different kinds of clouds. What are the Causes of Weather? Wet weather is the result of changes in the air. Heat from the sun affects weather. Wind causes changes in the weather. The Thermometer is used to measure heat. Enrichment Materials How the thermometer works, what it tells us, and how it helps us.	The Earth We Live On. The earth has interesting geographical features. Rocks, soil and water are part of the earth. Wonders in the Sky. There are many interesting things to know about the sun, moon and stars. The Air Around Us. Air is part of the earth. It is found in soil and water. It takes up space.
ENERGY AND MACHINES		Machines. Help us to do work more easily and more quickly. Should be well cared for. Magnets. Do interesting things. Energy and Machines	Work. Requires energy which comes from many sources. Machines. Help us to move things by use of rollers, wheels and ball bearings. A Dry Cell will light a bulb and ring an electric bell. Rust. Some things rust and some things do not. Rust can be prevented.	Wheels and Levers. Are machines which make work easier. Magnets and Electricity. A magnet has two poles. A compass needle is a magnet. A dry cell provides electrical energy. A switch controls the flow of electricity.

GRADE IV	GRADE V	GRADE VI
How Living Things are Grouped. All things fall into living or non-living categories. All living things are either plants or animals. Animals may be sub-divided into seven groups. Plants may be divided into two groups. **The World of Micro-Organisms.** **All Living Things Exchange Materials with their Environment.** Plants use carbon dioxide to make food. Plants need water to dissolve food. Animals need water to make digestive juices and the liquid part of the blood.	**Where Do Plants and Animals Come From and How Do They Grow?** Mammals, birds, amphibians, etc., have distinctive differences. **Where Plants Grow** **Enrichment.** Plants differ in many ways of reproducing themselves.	**What is the History of Plants and Animals?** What the earth was like long ago. Fossils were created in the early ages of the earth. Plants and animals have changed through time. Ability to adapt has been necessary for survival. **Interdependence of Plants and Animals** Animals depend on other animals. Plants depend on plants and plants on animals. **Problems of Man in Space** G-Force. Man inside space capsule.
The Earth and its Shape. It revolves around the sun. It spins on its axis around the sun. It has a blanket of air which is a mixture of gases pressing on all things. Man uses this pressure. It has soil on its surface essential to plants and animals. It contains valuable rocks and minerals.	**What is the Universe Like?** The earth is part of a great solar system. Comets are visitors in our solar system. An eclipse is caused by one heavenly body getting in the way of another. We have theories about how the earth came to be as it is now. The Milky Way is made up of stars. Beyond the Milky Way are many other galaxies which cannot be seen without a telescope. **Changes in the Earth's Surface.**	**Weather and How We Forecast it.** There are causes for the various kinds of precipitation and wind. **The Nature of Space.** Why we probe space.
Electricity. There are many interesting facts about static electricity. Electricity will work for man in many ways. It is safe to work with dry cells in experiments. Current will flow through a conductor but not through a non-conductor. **Our Body is Like a Machine.** Muscles move, bones and joints are levers, food provides energy. **Machines Help Man.** Machines using many sources of energy assist man in a variety of ways.	**Electricity.** Electric current can be produced in different ways. Electric current will flow in a closed circuit. Electric wires are covered with insulators for safety. An electric current has many uses. **Heat and Cold Have an Effect on Materials.** Heat travels. Heat and cold cause changes in gases, liquids and solids. **What Things are Made of.** Every kind of material has its own characteristics. All materials are made up of elements. Elements combined in chemical change make compounds. A molecule is the smallest possible particle of most substances. Chemical changes produce new material with heat gained or lost. **Fire Can be Controlled.** Heat and light are given off when materials burn. It is important to conserve our fuel supply.	**Machines Can Fly.** Man has developed machines for flying. **Machines Help Us to do Work.** Work is done when an object is moved. A machine is a device to make work easier. **Rockets and Space Vehicles.** **Sound.** All sounds are made by vibration. Sound travels by vibrations in solids, liquids and gases. Sound waves can be controlled. Sounds differ in many ways. **Light.** Most light comes from heated materials. We can see objects because they give off light or reflect light. Light is a form of energy. Lenses bend light. Things have different colors. Proper lighting is important.

TEACHER'S NOTES:

This teacher's classroom excursion to the local chick hatchery provided the motivation required for further study of animals in her classroom.

Grade One

Living Things

Recommended Science Texts:

Look & Learn
—Beauchamp

Science Near You
—Craig

Exploring Science Bk. I
—Thurber

I. SOURCES OF INFORMATION FOR YOUR PUPILS

REFERENCES

Texts

1. Beauchamp—pp. 3-24
2. Craig—pp. 10-23
3. Thurber—pp. 4-15, 28, 29, 37, 52, 53, 62, 63, 106, 107, 109, 130, 140, 144, 145

Filmstrips

Animal Homes Series (Curr.)
  Nests, Pk 1834
  Caves, Pk 1835
  Burrows, Pk 1836
  Hollow Trees, Pk 1837
  Lodges, Pk 1838
  Insect Communities, Pk 1839
Animal Protection Series (Curr.)
  Body Covering, Pk 2412
  Protective Coloring, Pk 2413
  Using Protective Coloring, Pk 2414
  Protective Weapons, Pk 2415
  Protective Behavior, Pk 2416
Work Animals Around the World Series (Curr.)
  Sandy the Sheepdog (Scotland), Pk 2284
  Pinto the Cow Pony (Argentine), Pk 2285
  Orello the Donkey (Sicily), Pk 2286
  Gunda the Elephant (India), Pk 2287

Films

Animal Friends, T 1183
How Animals Help Us, Tk 1127
Our Animal Neighbors, T 740
The Zoo, Tk 591

II. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—pp. 53-69
2. Craig—pp. 70-81, 88-95
3. Thurber—pp. 22-25, 42, 43, 110-119, 132-139

CONCEPTS TO DEVELOP

I. ANIMALS

A. Animals live in various environments
  1. Some animals live on land
  2. Some animals live in water
  3. Some animals live on land and can fly
  4. Some animals live both on land and in water

B. Most animals find or build homes
  1. Most birds make nests
  2. Some animals make colony homes
  3. Some animals use shelters they find available
  4. Man must provide shelter for domesticated animals

C. Animals must have food to live and grow
  1. Wild animals find food in the environment
  2. Animals that are domesticated by man must be fed by him

D. Man uses animals for various purposes
  1. Some animals provide pleasant companionship
  2. Some animals provide man and animals with food
  3. Some animals provide man with materials for clothing
  4. Some animals assist man in his work
  5. Some wild animals are confined in order to provide opportunities to observe and study them

E. How Do Animals Prepare for Winter?
  1. Change appearance (color and thickness of coats)
  2. Storing food
     a. by growing fat, b. by stocking a cache
  3. Change habits
     a. hibernate (bears, insects, frogs, etc.) b. stay indoors, c. gather in herds
  4. Migrate
     a. birds, b. animals

II. PLANTS

A. Plants live in various places.
  1. Some plants live on land.
  2. Some plants live in water.

B. People and animals use plants in various ways.
  1. Some plants are used for food and clothing.
  2. Some plants provide man and animals with shelter.
  3. Some plants provide aesthetic pleasure.

C. How are plants adapted for winter?
  1. Change appearance—a. color, b. foliage.
  2. By dying.
  3. By slowing down of growth.
  4. They store food in their roots.

SUGGESTED TREATMENT

TEACHER'S NOTES

Some Activities to Try:

1. In the science corner, pets such as hampsters, white rats, a bird and a bowl of goldfish would provide a varied group of animals to study.
2. Visit a chick hatchery, the zoo, a museum.
3. Make a class survey of pets which the children have in their homes. Obtain a picture of each different kind of pet and discuss each kind's needs with the children. Note the needs which are common to all.
4. Watch for signs of seasonal changes such as bird migrations, hibernating animals, insect activity, and changes in plants.

Other excellent suggested activities may be found in the teacher's edition of the science texts.

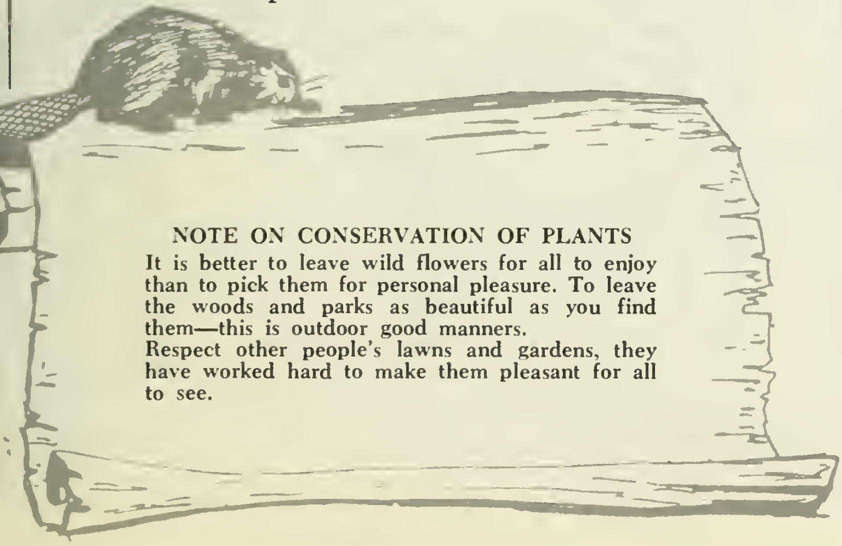
NOTE: The section on animals can be integrated with such enterprises as pets, the circus or the farm. This is especially true of sections C, D and E.

CONSERVATION

Conservation is a way of life. Too frequently we associate conservation with saving. We can hardly expect Division I children to be conscientiously saving for the ultimate benefit of their great grandchildren. It is better at this level to stress an equally important aspect of conservation—the wise use of things—our personal resources (time, money and property) as well as the natural resources.

Suggested Activities:

1. Field Trips
   a. Field trip to see plants that grow in different places.
   b. Collect pictures of plants that help men and animals.
   c. Collect leaves in the fall when the plants are getting ready for winter.
2. Grow plants in the classroom—some grow better in bright sunlight, others grow better in shaded spots.
3. Put potatoes in a warm dark place to grow and one or two in the sunlight.
4. If possible have an aquarium for fish. Grow water plants at the same time.



NOTE ON CONSERVATION OF PLANTS

It is better to leave wild flowers for all to enjoy than to pick them for personal pleasure. To leave the woods and parks as beautiful as you find them—this is outdoor good manners.
Respect other people's lawns and gardens, they have worked hard to make them pleasant for all to see.

The Earth and the Universe

I. II. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts
1. Weather
   a. Beauchamp—p. 39-52
   b. Thurber—p. 40-53, 132-145
2. What We See In the Earth Around Us
   a. Craig—p. 4-9, 56-59, 60-69
   b. Thurber—p. 120-131
3. Reading—Our New Friends
   The Big Umbrella
   The Snow Party

Audio-Visual Materials

Filmstrips

Through the Seasons Series (Curr.)
- Fall in the Country and Town, Pk 2247
- Winter in Country and Town, Pk 2248
- Spring in Country and Town, Pk 2249
- Summer in Country and Town, Pk 3045

Through the Seasons Series (YAF)
- In the Autumn, Pk 2833
- In the Winter, Pk 2834
- In the Spring, Pk 2835
- In the Summer, Pk 2836

Our Weather, Pk 2675 (EBF)

III. Texts
1. Sky
   a. Beauchamp—p. 39-46
   b. Craig—p. 50-55
2. Air
   a. Craig—p. 42-49
   b. Thurber—p. 82-95

Reading: From Morning to Night
Everyday Life Stories
For the Children's Hour:
Seed Babies' Blanket
The Snowflake and the Leaf
At Play:
Fun in the Snow
The Snowman's House
I know a Secret
Snow Snow
Spring is Here

CONCEPTS TO DEVELOP

I. WEATHER

A. From day to day.
   1. Sun, wind, rain, snow and temperature combine in different ways to make our weather.
   2. Weather changes often.
   3. We adjust our activities to weather conditions.
   4. We can predict changes in weather.
      a. dark clouds gather before a storm
      b. when the clouds begin to break the storm is usually over
      c. a rainbow usually means the end of a rain storm
      d. it is often windy before a storm.

B. Through the seasons.
   1. The seasons are spring, summer, autumn and winter.
   2. The seasons follow in order.
   3. Seasons have characteristic weather conditions.
   4. We adjust clothing and activities to the seasons.

II. WHAT DO WE SEE ON THE EARTH AROUND US?

A. Rocks are:
   1. soft or hard
   2. big or small
   3. smooth or rough.

B. Land:
   1. is flat or hilly
   2. of some kinds can grow plants and land of some other kinds cannot
   3. is made of soil and rocks.

C. Water:
   1. is seen in lakes, rivers, streams, sloughs and oceans
   2. can make plants grow on land
   3. helps to keep us clean
   4. is the place where fish live
   5. is a place for safe play.

III. WHAT WE SEE IN THE SKY

A. We see the sun in the daytime.
B. We see the moon and stars at night.
C. We see clouds during the day and at night.
D. Sometimes we do not see the sun, moon or stars because of clouds.
E. The sun, moon and stars help us.
   1. The sun gives us light and heat.
   2. The moon and stars help us to see at night.

IV. AIR IS ALL AROUND US

A. Air is something that is real.

B. How we know there is air.
   1. We can feel it.
   2. We can see it move things.
   3. We can put it in things.

C. Air which is not fresh may not be safe.
   1. Exhaust fumes from automobiles are poisonous. We should never be in a closed garage when a car's engine is running.
   2. Too much smoke may cause a person to lose consciousness and die.

SUGGESTED TREATMENT

1. **Field trips**
   a. examination of stones
   b. note where plants grow most luxuriantly
   c. note vegetation near a pond
   d. if possible see an anemometer and other weather instruments

2. **Make a windmill from paper.**

3. **Follow the weather on a simple weather calendar.**

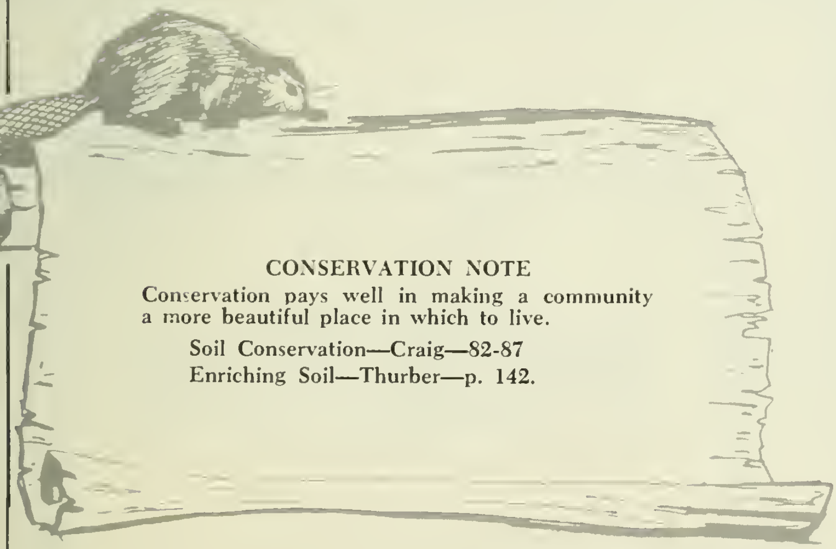
4. **Place a full bottle of water with a tight lid out on the window sill in below freezing weather.** The breaking of this bottle will help children learn that water and liquids containing a high percentage of water will expand when they freeze. Application of this learning would include such things as bringing in the milk as soon as the milkman leaves it, draining the outside hose connections, etc.

The weather knowledge may be handled in any seasonal enterprise such as "Winter Fun," "Here Comes Summer," "We Prepare for Winter."

Study may be centered around topics such as: "What do we see in the sky?" "What do we see on the earth?", etc.

Have children decide how we test the reality of anything—what sensory impressions are missing in testing reality of air.

For further excellent suggestions consult the teacher's edition of the texts.



CONSERVATION NOTE

Conservation pays well in making a community a more beautiful place in which to live.

Soil Conservation—Craig—82-87
Enriching Soil—Thurber—p. 142.

TEACHER'S NOTES

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 25-38
2. Craig—p. 24-37
3. Thurber—p. 150-157, 68-81

Audio-Visual Aids

Filmstrips

Men Who Build Our Houses, Pk 2686 (Curr.)

People and Goods Travel Series (J. Handy)
- Airplanes, Pk 3496
- The Passenger Train, Pk 3497
- The Freight Train, Pk 3498
- Buses, Pk 3499
- Trucks, Pk 3500
- Boats and Ships, Pk 3501

Road Builders at Work, Pk 2226 (Curr.)

CONCEPTS TO DEVELOP

I. MACHINES

A. We have machines to help us do the work.
1. We use machines in our homes.
2. We use machines on our farms.
3. We use machines in our community.

B. Machines help us in doing these things easily and quickly.
1. Travelling.
2. Sending messages.
3. Moving things.
4. Building things.

C. We should take good care of machines.
1. They should not be left in the rain and sun.
2. They should be fixed if they get broken.
3. Things which are left where they don't belong may cause accidents.

II. MAGNETS

A. Magnets do interesting things.
1. Magnets attract some things.
2. Magnets do not attract some things.
3. Magnets have different shapes.
4. Toys can be made using a magnet.

SUGGESTED TREATMENT

TEACHER'S NOTES

Study machines could be integrated with "We Play House" or "Friends in Our Town." Fire could be integrated with "Our Family" or any enterprise connected with home activities.

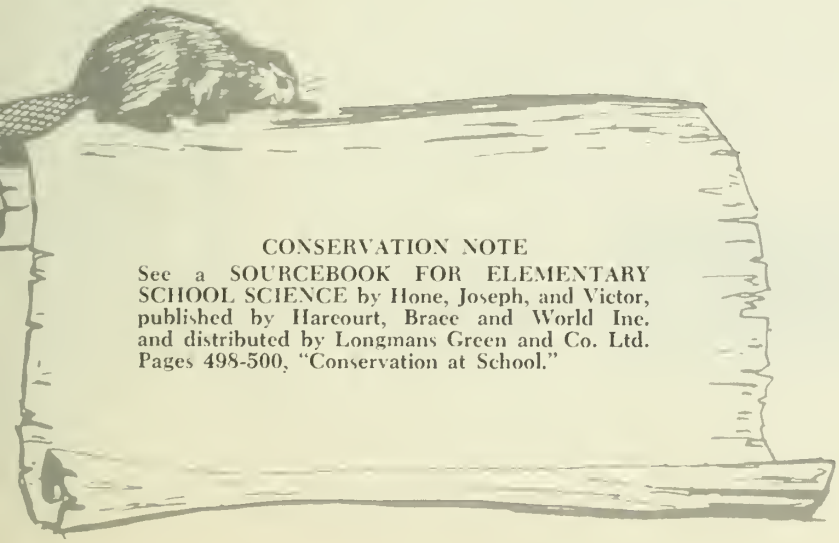
Activities:

1. Field Trips to see machines, preferably in use. Note safety guards.
2. Discuss and examine children's own machines: bicycles, wagons, toys.
3. Machines are made use of in all enterprise construction work. Attention should be drawn to the ways in which such machines make work easy.
4. A small magnet lifts little things, a big magnet lifts big things.

Magnets: This should be taught as an experimental unit.

Do not attempt to teach it without having magnets for children to use. May be considered enrichment material.

Further excellent suggestions may be found in the teacher's edition of the texts.



CONSERVATION NOTE

See a SOURCEBOOK FOR ELEMENTARY SCHOOL SCIENCE by Hone, Joseph, and Victor, published by Harcourt, Brace and World Inc. and distributed by Longmans Green and Co. Ltd. Pages 498-500, "Conservation at School."

TEACHER'S NOTES:

This Grade II science display shows spring science activities.

Grade Two

Living Things

Recommended Science Texts

All Around Us
—Beauchamp

Science Around You
—Craig

Exploring Science Bk. II
—Thurber

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Animals

1. Beauchamp—3-28
2. Craig—64-77, 90-109, 134, 136, 137
3. Thurber—4-18, 114-116, 145-158

Plants

1. Beauchamp—61-77
2. Craig—70-74, 90-109, 138-143
3. Thurber—103-116

Audio-Visual Aids

Films

Sparky the Colt, T 706
Frisky the Calf, T 714
Animals Growing Up, T 619
Farm Babies, Tk 1225
Adventures of a Baby Fox, T 1090
Adventures of Two Little Goats, T 1231
Washing time at the Zoo, T 606

Filmstrips

Black Bear, Pk 2771 (NFB)
Farm Animals, Pk 3479 (EBF)
Farm Pets, Pk 2374 (Curr.)
How Mammals Get Their Food, Pk 2486 (Curr.)
How Birds Get Their Food, Pk 2487 (Curr.)
Life on a Large Ranch, Pk 2979, (YAF)

CONCEPTS TO DEVELOP

I. ANIMALS

A. Animals must have food to live and grow.

1. Some baby animals eat the same kind of food as the parents.
2. Baby mammals get milk from the mother's body.
3. The ability to move about is important in food getting.
4. Some baby animals are able to get their own food.

B. Baby animals receive varying degrees of parental care and protection.

1. Many baby animals get milk from the mother's body.
2. Most baby animals that cannot move about competently are fed by the parents.
3. Many baby animals that cannot move about competently get parental protection from other animals which might harm them.
4. Some baby animals get no parental protection.
5. Alberta's hunting laws protect the parent animals during the period in which the young are dependent upon them.

II. PLANTS

A. Sufficient light and water are necessary for growth.

1. Seeds need water to germinate.
2. Green plants die if they are deprived of light for too long at a time.
3. Plants die if they are deprived of water for too long a time.

B. How seeds travel.

1. Wind
2. Water
3. Animals
4. Explosion

SUGGESTED TREATMENT

The study of animals could be integrated in part with such an enterprise as "Animals that Help Us."

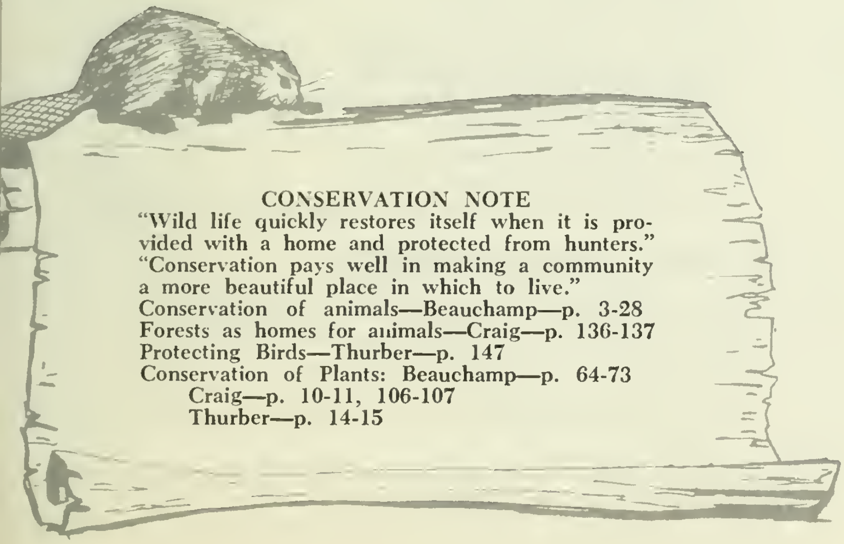
1. A visit to a farm where there is a litter of small pigs or some baby lambs might add meaning to the term mammal.
2. The study of plants could be integrated in part with such enterprises as: "Plants that Help Us" or "We Visit the Farm."

The section on "How Seeds Travel" would be a natural for a science field trip.

1. Visit the zoo or museum, if possible, to learn about animal requirements.
2. Make a collection of seeds. Collect pictures of them exploding from pods, etc.
3. Display pictures of drought and flooded areas. Remind children that these catastrophes usually happen because man had not been using the natural resources wisely.

Other excellent suggestions may be found in the teacher's editions of the texts.

TEACHER'S NOTES



CONSERVATION NOTE

"Wild life quickly restores itself when it is provided with a home and protected from hunters."

"Conservation pays well in making a community a more beautiful place in which to live."

Conservation of animals—Beauchamp—p. 3-28
Forests as homes for animals—Craig—p. 136-137
Protecting Birds—Thurber—p. 147
Conservation of Plants: Beauchamp—p. 64-73
    Craig—p. 10-11, 106-107
    Thurber—p. 14-15

Grade 2

The Earth and the Universe

CONCEPTS TO DEVELOP

I. WHAT WE CAN LEARN FROM THE SKY

A. Direction
  1. The sun rises in the east and sets in the west.
  2. Stars help us find our way.

B. The Moon
  1. Seems to change its shape following a regular pattern each month.
  2. Has a "face."

C. Clouds
  1. There are different kinds of clouds.
    a. light and fluffy—heavy and dark.
    b. high and low.
    c. white and dark.
  2. Clouds change with the weather.
    a. rain clouds are low and dark.
    b. fog and mist are low clouds.

II. WHAT ARE THE CAUSES OF WEATHER

A. Causes of wet weather.
  1. Water goes into the air.
  2. Water comes out of the air.
  3. Rain falls when it is warm.
  4. Snow falls when it is cold.
  5. Sleet is a mixture of rain and snow.
  6. Fog and mist occur when the air is very wet and so heavy that clouds don't rise.

B. The heat from the sun affects weather.
  1. In the morning there is less heat from the sun.
  2. The afternoon sun is the hottest.
  3. The evening sun gives less heat.
  4. The sun is in the sky most in the summer and least in the winter.
  5. The sun is hottest in the summer and coolest in the winter.
  6. We measure heat with a thermometer.

C. Wind causes weather.
  1. Some winds cause rain or snow.
  2. Some winds dry up the rain and snow.
  3. Some winds are cold.
  4. Some winds are warm.
  5. Very strong winds do damage.
  6. Winds carry dust and smoke.
  7. There are many ways of observing the force and direction of the wind.
    a. trees bend with the wind
    b. airports use wind socks
    c. smoke from chimneys changes with the wind.

III. THE THERMOMETER

A. The thermometer is a very useful instrument.
  1. It tells us how cold or warm the air is.
  2. The liquid in the tube rises when it is warm.
  3. The liquid in the tube falls when it is cold.
  4. The thermometer helps us choose our clothing for the day.
  5. It helps us keep our homes and school comfortable.
  6. It helps us in cooking.

I. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts
1. Craig—p. 52-63
2. Thurber—p. 19-32

Audio-Visual Aids

Filmstrips

Primary Science Series (EBF)
  Night and Day, Pk 2673
  The Seasons, Pk 2674
  The Air, Pk 2676
  The Earth, Pk 2677

II. III. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts
1. Weather
  a. Craig—p. 4-39
  b. Beauchamp—41-60
  c. Thurber—p. 33-48
2. Thermometer
  a. Beauchamp—p. 48-53
  b. Thurber—p. 33-48

Audio-Visual Aids

Filmstrips

Our Weather, Pk 2675 (EBF)

First Experiments About Weather (J. Handy)
  What is Wind? Pk 3589
  Where Do Clouds Come From?, Pk 3590
  How Does Water Get Into the Air?, Pk 3676

SUGGESTED TREATMENT	TEACHER'S NOTES

What We Can Learn From the Sky

This unit would be best kept as a separate science unit.

Activities:

1. Find pictures of various shapes of the moon on calendars.
2. See if the moon looks so at the time of the month indicated.
3. Encourage pupils to locate North Star, Big Dipper, etc.
4. Field trip to see clouds.
   Note: wispy cirrus clouds (high)
   stratus (layered)
   fair weather cumulus (big white fluffy clouds)
   cumulonimbus (dark rain cloud)
   Teacher should be able to identify these without using proper names.

Further excellent suggestions may be found in teacher's editions of texts.

CONSERVATION NOTE

Water is a national treasure and should be used wisely. Without it life is impossible. Water is always going somewhere.

"Unto the place from whence the rivers come, thither they return again."

Causes of Weather

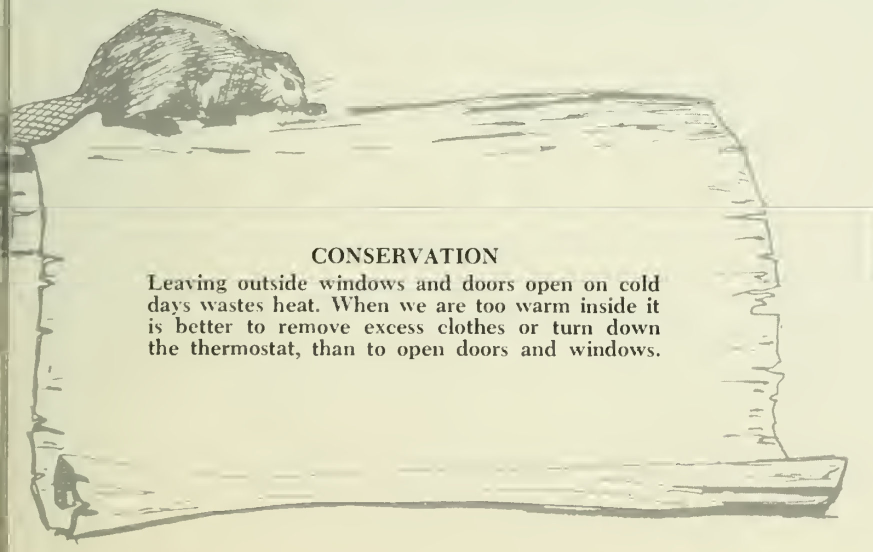
Weather and the Thermometer can perhaps be best kept as separate science units.

Suggestions and Activities:

Experiment with finding the temperature of your hand, ice water, the inside of a refrigerator, inside atmosphere of school.

Outside atmosphere.

1. See the wind sock at the airport.
2. Make a small wind sock.
3. Make a weather vane.
4. Label major directions on a compass. Decide from which direction the wind is coming each day for a week.



CONSERVATION

Leaving outside windows and doors open on cold days wastes heat. When we are too warm inside it is better to remove excess clothes or turn down the thermostat, than to open doors and windows.

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Work
   a. Beauchamp—p. 29-40
   b. Craig—p. 110-131
   c. Thurber—p. 129-144

2. Machines
   a. Beauchamp — p. 35-40
   b. Craig—p. 118-131
   c. Thurber—p. 129-144

3. Rust
   a. Thurber—p. 117-128
   b. Craig—p. 135

Audio-Visual Aids

Filmstrips

Energy and Engines, Pk 2297 (Curr.)

The Story of Machines, Pk 2392 (Curr.)

Wind and Water Engines, Pk 2298 (Curr.)

CONCEPTS TO DEVELOP

I. WORK

A. Work is done when things are moved

B. Energy is needed to do work

C. Energy comes from many sources
   1. Our own muscles
   2. Springs
   3. Electricity
   4. Wind
   5. Water
   6. Animals
   7. Coal
   8. Gasoline
   9. Oil

II. MACHINES HELP US IN MANY WAYS

A. Rollers make it easier to move things
B. Wheels make it easier to move things
C. Ball-bearings make it easier to move things

III. FUN WITH A DRY CELL

(Suggested Enrichment)

A. A dry cell will light a bulb
B. A dry cell will ring an electric bell

IV. RUST (Suggested Enrichment Topic)

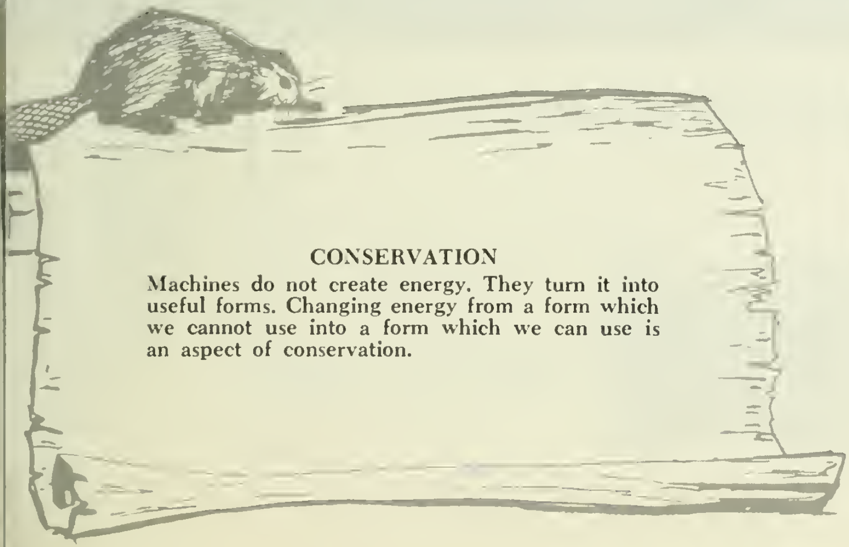
A. Some things rust
B. Some things do not rust
C. Oil helps prevent rust
D. Paint helps prevent rust
E. Water helps cause rust

SUGGESTED TREATMENT

1. Take a ball bearing apart.

   Do experiment with cookie lids as suggested in Exploring Science.
2. Collect pictures of work being done by wind, electricity, gasoline, animals, man.
3. Fun with a dry cell should be attempted if equipment is available to experiment.
4. In enterprise activities where simple machines are used to do work take note of how much easier wheels or rollers make work.

For further excellent suggestions consult the teacher's editions of the recommended texts.



CONSERVATION

Machines do not create energy. They turn it into useful forms. Changing energy from a form which we cannot use into a form which we can use is an aspect of conservation.

TEACHER'S NOTES

TEACHER'S NOTES:

The teacher of this Grade III classroom used his children's interest in their Christmas toys to develop a profitable teaching unit on "toys".

Grade Three

Living Things

Authorized Science Readers

How Do We Know?
—Beauchamp
Science Everywhere
—Craig
Exploring Science Bk. III
—Thurber

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Animals

1. Beauchamp—p. 3-36
2. Craig—p. 4-45
3. Thurber—p. 40-41, 67-69, 74-92, 159-174, 186-187

Plants

1. Beauchamp—p. 53-72
2. Craig—p. 60-61, 101, 106, 153
3. Thurber—p. 175-188

Audio-Visual Aids

Filmstrips

The Beaver, Pk 1811 (NFB)
The Behaving Plants, Pk 2431 (Curr.)
Birds of the City, Pk 3425 (NFB)
The Canada Goose, Pk 2395 (NFB)
The Cat Family, Pk 3772 (NFB)
The Frog, Pk 2561 (NFB)
Hibernation, Pk 1830 (Curr.)
How Amphibians Get Their Food, Pk 2489 (Curr.)
How Fish Get Their Food, Pk 2490 (Curr.)
How Insects Get Their Food, Pk 2491 (Curr.)
How Reptiles Get Their Food, Pk 2488 (Curr.)

Films

The Beaver, Tk 1184
Birds of the Dooryard, Tk 484
Five Colorful Birds, Tk 483
Grey Owl's Little Brothers, T 378
How Nature Protects Animals, T 461
Hummingbird Home Life, T 345

CONCEPTS TO DEVELOP

I. ANIMALS

A. Animals have structures that enable them to get food in various types of habitats.
  1. Some animals can move about and get food on land.
  2. Some animals can move about and get food in water.
  3. Some animals have structures that enable them to get food on land and in water.

B. Animals have primary food-getting structures (enabling them to seize and get food into the body) and secondary food-getting structures (enabling them to locate food and get at it).

C. Wild-animal life can be conserved by man.

II. PLANTS

A. Plants with roots cannot move to obtain food.
  1. Roots get food and water from the soil.
  2. Leaves get sunshine and air.

B. Plants have "enemies" that can destroy them or retard their growth.
  1. Some insects can destroy the leaves and stems of plants.
  2. Weeds can retard the growth of other plants.

C. Plants are protected by man so that he can derive food and pleasure from them.

SUGGESTED TREATMENT	TEACHER'S NOTES

1. Animals

A. This section could be integrated with the first section of the Enterprise—"Life in the Community." For example, the animal life of the community could be used to demonstrate these first three headings.

B. Could be included in an enterprise on geography. For example, in a study of Holland the structures and adaptations of the stork, fish and mole are discussed.

C. The first section of the Enterprise, "Life in the Community," could include the hunting seasons and game restrictions of our community.

2. **Plants**

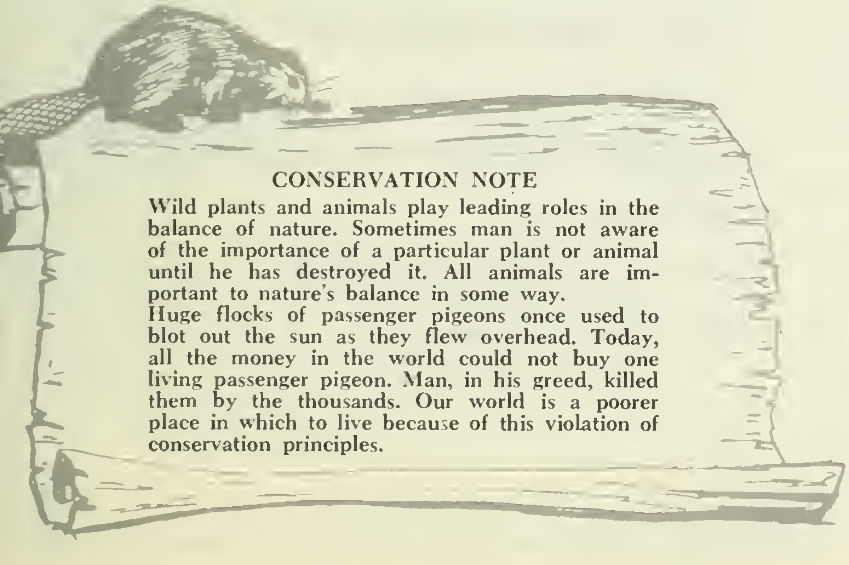
A. This also could be integrated in the first section of the Enterprise. For example, the value of irrigation crops in our community.

B. & C. This could be covered with the science section of the Enterprise. For example, a study of cotton, the parts of the plant, its enemy, the Boll Weevil, the value of cotton to man, and the different methods of seed dispersal could be included.

Suggested Activities:

1. Make a terrarium with a cookie tin, four sheets of glass for the sides. Set in plaster of paris. A screen for the top will keep in frogs, grasshoppers, etc. A large wide-mouthed jar can also be used to make a terrarium.
2. Pupils should know the plants and animals which are protected from possible extinction. Pictures of rare plants should be collected. Pictures of protected birds and animals should also be obtained.

Be sure to consult the teacher's editions of the texts for other excellent suggestions.



CONSERVATION NOTE

Wild plants and animals play leading roles in the balance of nature. Sometimes man is not aware of the importance of a particular plant or animal until he has destroyed it. All animals are important to nature's balance in some way.

Huge flocks of passenger pigeons once used to blot out the sun as they flew overhead. Today, all the money in the world could not buy one living passenger pigeon. Man, in his greed, killed them by the thousands. Our world is a poorer place in which to live because of this violation of conservation principles.

Grade 3

The Earth and the Universe

SOURCES OF INFORMATION FOR YOUR PUPILS

I., II. Texts
- 1. Earth
  - a. Beauchamp — p. 37-52
  - b. Craig—p. 98-115
- 2. Sky
  - a. Craig—p. 116-133
  - b. Thurber—p. 5-18

Audio-Visual Aids

Filmstrips
The Night Sky, Pk 2678 (EBF)
Our Earth is Round, Pk 3231 (YLP)

Films
Our Big Round World, Tk 1037
Our Soil Resources, T 505

III. Texts

Craig—p. 86-97

Other References
The Sky Above Us—Parker
Pathways to Reading—Storyland (Nelson & Co.)
Nature Activity Reader—The Sky Jewels
Outdoor World

Audio-Visual Aids

Film
Air Around Us, T 609

Filmstrips
The Air, Pk 2676 (SVE)
What is Air?, Pk 3232 (YLP)

CONCEPTS TO DEVELOP

I. THE EARTH WE LIVE ON

A. The earth has many interesting geographic features: mountains, deserts, islands, plains, lakes, streams, rivers, oceans, water-falls, canyons, geysers

B. Rocks, soil and plants are part of the earth

C. We use maps and globes to find out certain things about the earth

D. Land and water areas can be shown on a globe

II. WONDERS IN THE SKY

A. There are many objects in the sky—sun, moon and stars

B. The sun:
1. is the largest object in the day sky
2. is very far away
3. gives the brightest light we know
4. has been studied by scientists for many years

C. The moon
1. is smaller than the earth or sun
2. is nearer the earth than any other object in the sky
3. is solid like the earth
4. reflects light from the sun

D. Stars vary in:
1. size
2. brightness
3. distance from the earth

III. THE AIR AROUND US

A. The air is part of the earth

B. Air is found in soil, water and some rocks

C. Air takes up space

D. Air in some things makes them float

E. We live in a great ocean of air

SUGGESTED TREATMENT

TEACHER'S NOTES

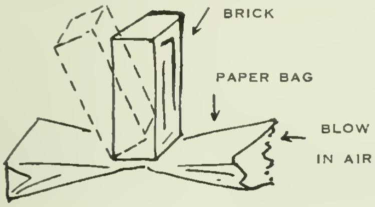
The section on Earth will correlate with the geography section of the enterprise. Wonders in the sky can perhaps best be handled as a science unit.

Some Activities to Try:

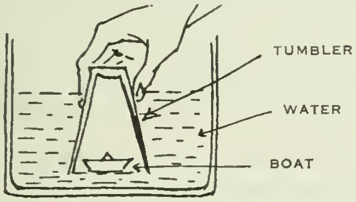
1. With children keep a week or two weeks' record of things children notice about the moon—markings, size, etc.
2. With flashlight and oranges or balls in a darkened room have pupils set up a miniature solar system.
3. Compare plants grown in sun to those in shade.
4. Discuss the fact that the rays which tan the skin cannot be seen.
5. Measure plant growth by counting the nodes on branches or the annual rings on a cross-section of a tree trunk. (Use a fire log.) Consider how long it takes to grow a tree and compare this with the time it takes to cut or burn it down.

Many other excellent suggestions may be found in the teacher's editions of the texts.

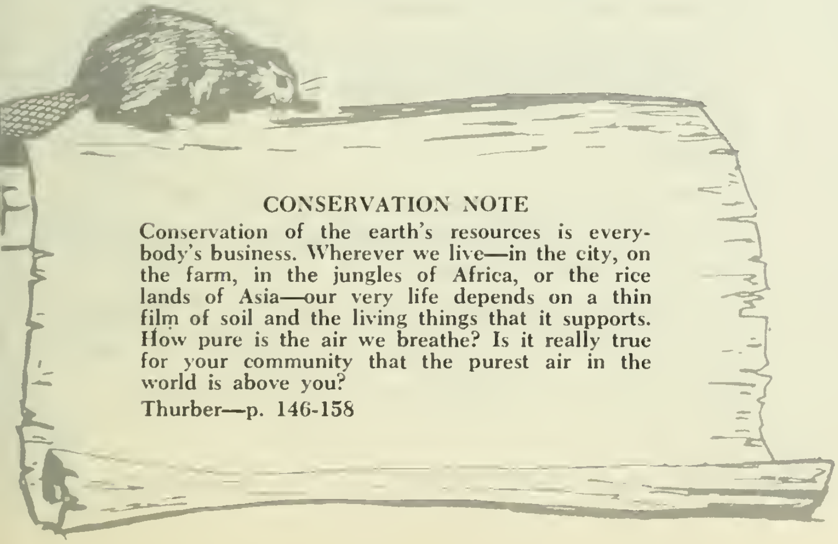
6. Experiment with air turning a pin wheel.
7. Use air pressure to tip over a brick.



8. To show that air takes up space make a paper boat (tiny). Float it on a tank of water. Place a tumbler over it and slowly submerge boat inside tumbler.



See also your teacher's editions of the texts for many other excellent suggestions for experiments.



CONSERVATION NOTE

Conservation of the earth's resources is everybody's business. Wherever we live—in the city, on the farm, in the jungles of Africa, or the rice lands of Asia—our very life depends on a thin film of soil and the living things that it supports. How pure is the air we breathe? Is it really true for your community that the purest air in the world is above you?

Thurber—p. 146-158

Grade 3

Energy and Machines

I. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 73-93
2. Thurber—p. 113-128

Other References

Simple Machines—Jeanette Smith
Story Book of Wheels—Petersham
Little Wonder Book—208

Audio-Visual Aids

Filmstrips

Introduction to Energy, Pk 3263 (YLP)
Simple Machines Help us Work Series (J. Handy)
  Levers, Pk 3502
  Wheels and Axles, Pk 3503
  Pulleys, Pk 3504
  Ramps, Pk 3505
  Wedges, Pk 3506
  Screws, Pk 3507
The Story of Machines, Pk 2392 (Curr.)

II. SOURCES OF INFORMATION FOR YOUR PUPILS

Using Magnets and Electricity

Texts

1. Beauchamp—no reference
2. Craig—p. 64-85
3. Thurber—p. 129-144

Audio-Visual Aids

Magnets, P 250 (YAF)

CONCEPTS TO DEVELOP

I. WHEELS AND LEVERS

A. Wheels

1. Wheels make work easier
2. Wheels need axles in order to turn
3. Wheels are operated by different kinds of force
   - a. muscle
   - b. motor
   - c. wind
   - d. moving water
4. Wheels are used in many ways
   - a. moving loads
   - b. transferring force
   - c. pulleys

B. Levers

1. Levers make work easier
   - a. they reduce the force needed to lift an object
   - b. the smaller amount of force needed the smaller the distance an object moves

II. USING MAGNETS AND ELECTRICITY

A. Magnets

1. A magnet has two poles
2. The poles are near the ends of the magnet
3. Poles are holding parts of the magnet
4. Like poles repel one another
5. Unlike poles attract one another
6. Some tools are magnetized
7. Iron and steel tools can be magnetized
8. A compass needle is a magnet that is free to turn

B. Electricity

1. We can get electrical energy from a dry cell
2. A dry cell, wires and a light bulb can make a complete pathway for electricity
3. A break in the pathway stops the flow of electricity
4. The flow of electricity can be controlled by a switch
5. A switch is a safety device and a convenience

SUGGESTED TREATMENT

TEACHER'S NOTES

Some Activities to Try:

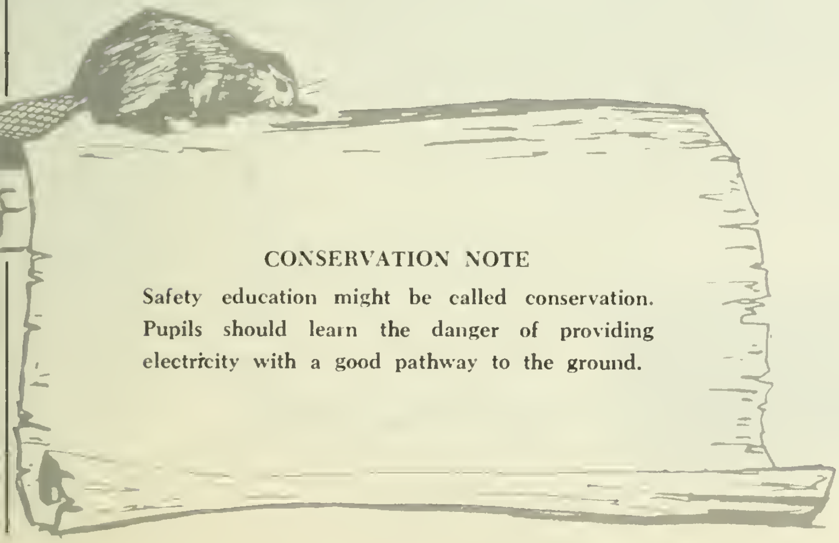
1. Have children collect pictures of machines having wheels, preferably types of machines children know and use.
2. Make a water wheel by tacking small sections of light board on to a heavy spool. Put a skewer through the spool.
3. Try to pull a box of sand without wheels and then in a wagon or with a set of roller skate wheels.
4. Have children collect pictures of levers such as a see-saw, cranes, etc.
5. Place a nail with only one painted end in a wet location until the unpainted end becomes rusty.
6. Show children how oil and grease reduce wasteful friction.

CONSERVATION

We can all learn to conserve. We must learn more and more not to waste things, especially we Canadians who are under the strong delusion that there is no limit to our resources.

7. See an electric fence when on a field trip. Children should see that the animal or person who touches the fence provides the electricity with a path to the ground and as a result gets a shock.
8. Simple switches may be taken apart and examined to see how the switch works to make and break a pathway to a light or other appliance.
9. Some attention should be drawn to the earth having two poles and hence our use of the compass.
10. Discuss ways of using electricity wisely in our homes and in school. Remember if a man falls down a dark stairway because he did not want to turn on the light and use electricity—this man is a poor conservationist.

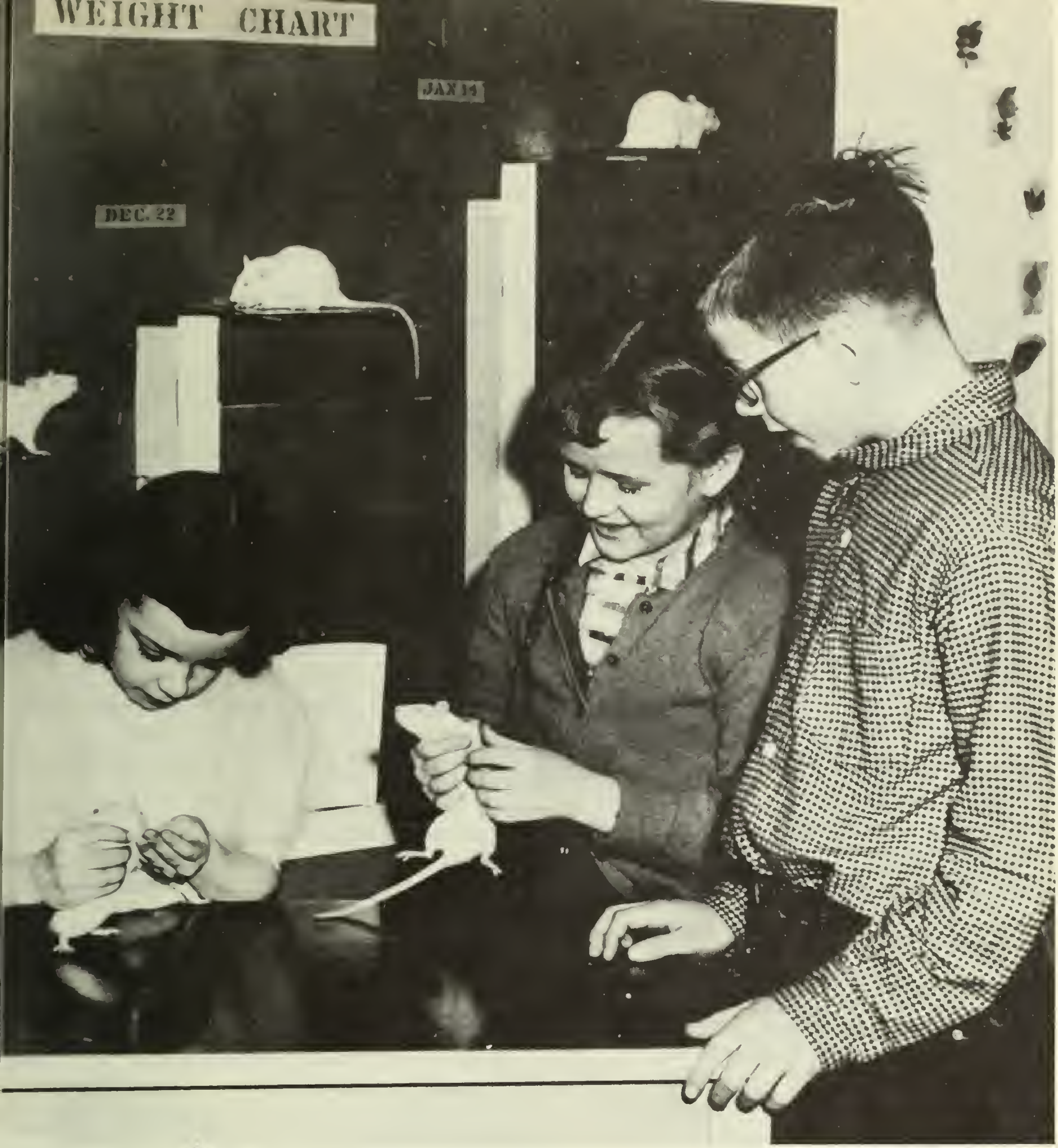
Other good suggestions for experiments may be found in the teacher's editions of the science texts.



CONSERVATION NOTE

Safety education might be called conservation. Pupils should learn the danger of providing electricity with a good pathway to the ground.

TEACHER'S NOTES:



These pupils carried out a diet experiment. The mice were fed different diets and their weights were checked periodically.

Grade Four

Grade 4

Living Things

Authorized Science Texts:
Beauchamp—Discovering Our World Bk. I
Craig—Discovering With Science
Thurber—Exploring Science Bk. IV

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts
1. Beauchamp—p. 9-37, 38-45
2. Craig—p. 144-163
3. Thurber—p. 81-96, 201-218

Review Section on Seasons
Craig—p. 1-64

Audio-Visual Aids

Films
Demons of the Deep—T 108
Reptiles—Tk 1112
Snakes are Interesting—Tk 986
Mammals are Interesting—Tk 953

Filmstrips
How Animals are Classified—Pk 3873 (J. Handy)
How Animals are Grouped—Pk 2877 (YAF)
Life of the Honey Bee—Pk 3278 (SVE)
Our Outdoor Friends Series (Curr.)
  Feathered Friends of the Lakeside, Pk 3120
  Visit to Gull Island, Pk 3121
  Our Very Friendly Birds, Pk 3122
  Our Hawks, Pk 3123
  Our Owls, Pk 3124
  Our Growing Animals, Pk 3125
  Grouse, their Homes and Habits, Pk 3126
  Birds of Lake and Marsh, Pk 3127
  Our Hoofed Animals, Pk 3128
Platypus and Echidna, P 1160 (Australia)

CONCEPTS TO DEVELOP

HOW LIVING THINGS ARE GROUPED

I. ALL THINGS IN THE WORLD ARE PUT INTO GROUPS

A. The two biggest groups of things are living and non-living.

B. All living things are alike in that:
  1. They need food.
  2. They need water.
  3. They respire.
  4. They can grow and develop.
  5. They change as they grow.
  6. They are made of similar kinds of substances (protoplasm).
  7. They move at some stage of their lives.
  8. They can have young like themselves.
  9. They can live only within a certain range of temperature and pressure.
  10. All of these similarities are necessary to distinguish between living and non-living things.

C. All living things may be divided into two large categories: The Animal and Plant Kingdoms.

D. The Animal Kingdom contains about 30 groups, of which the following are the most common or familiar:
  1. Animals with backbones and a bony skeleton inside the body are called vertebrates.
    a. **Fish** (trout, perch, salmon)
      (1) are usually covered with scales
      (2) have fins
      (3) are cold-blooded (body temperature changes with that of surroundings)
      (4) breathe the air dissolved in water with gills
      (5) live almost entirely in water
    b. **Amphibians** (frogs, toads, salamanders)
      (1) lead life on water and on land (must be hatched in water)
      (2) have moist, smooth, scaleless skins
      (3) change from gill-breathing young to lung-breathing adults
      (4) are cold-blooded (body temperature changes with that of surroundings)
    c. **Reptiles** (snakes, lizzards, turtles, dinosaurs, alligators)
      (1) are covered with scales or shells made from fused scales
      (2) are cold-blooded (body temperature changes with that of surroundings)
      (3) breathe air with lungs
    d. **Birds** (sparrow, magpie, canary, penguin)
      (1) are covered with feathers
      (2) have two wings and two legs
      (3) have a bill
      (4) are warm-blooded (have a constant body temperature)
      (5) breathe air with lungs
      (6) hatch from eggs with brittle shells

SUGGESTED TREATMENT

TEACHER'S NOTES

Suggested Treatment:

Sections A, B and C can probably be treated as a separate science unit.

Section:

D (1-a.) Fish as food, Section C, A, B. Fishing for Sport — "Jill Catches a Swordfish," p. 4 — YOUNG EXPLORERS, "Four Little Bears," p. 156 — YOUNG EXPLORERS.

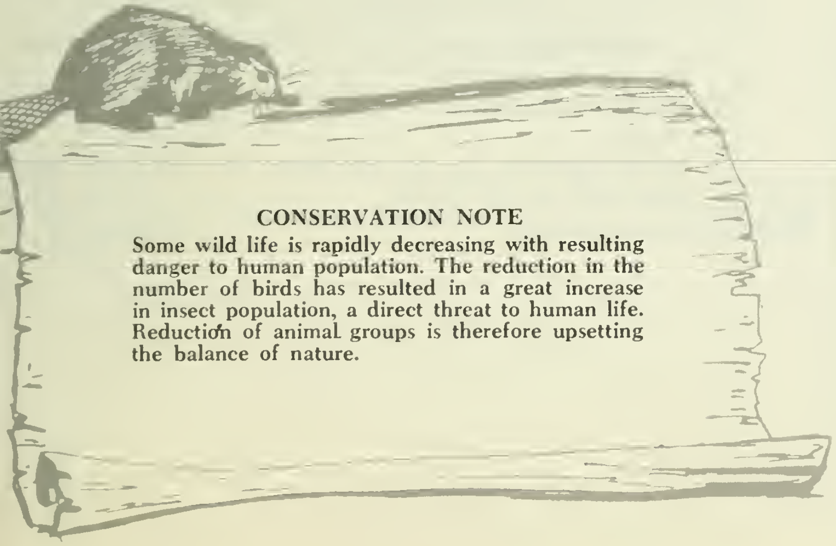
(1-b.) Taught as nature-science lesson.

(1-d.) Birds as food, Section C. Strange birds in new land, history section of social studies. Carrier pigeons, "Keep 'Em Flying," p. 344—YOUNG EXPLORERS.

Suggested Activities:

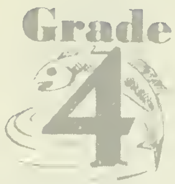
1. If there is a zoo or a pet shop in your neighborhood visit it to permit the children to identify the various types of animals on display.
2. Keep a few goldfish for a time. Stir water to increase oxygen. Discuss use of fins, scales, etc.
3. Keep a number of frogs' eggs for a time until tadpoles develop and develop into frogs.
4. Build a bird-feeding station.
5. Read stories of carrier pigeons. Read of use made of pigeons in carrying news in the past.

Many other excellent suggestions may be found in the authorized science texts.



CONSERVATION NOTE

Some wild life is rapidly decreasing with resulting danger to human population. The reduction in the number of birds has resulted in a great increase in insect population, a direct threat to human life. Reduction of animal groups is therefore upsetting the balance of nature.



Living Things

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 197-214
2. Craig—p. 128-143
3. Thurber—p. 97-112, 21-34, 35-48

Audio-Visual Aids

Films

Every Drop a Safe One, T 47
Snapping Turtles, T 465
Demons of the Deep, T 108

Filmstrips

The Behavior of Plants, Pk 2431 (Curr.)
Creatures of the Sea, Pk 2116 (Disney)
Insects Around Us Series (J. Handy)
  Finding Out About Insects, Pk 3020
  Insect Homes, Pk 3021
  How Do Insects Protect Themselves, Pk 3022
  Our Insect Enemies and Insect Friends, Pk 3023
  Collecting Insects, Pk 3024
Story of Pacific Salmon, Pk 3249 (NFB)
The Common Loon, Pk 2931 (NFB)
The Frog, Pk 2561 (NFB)

CONCEPTS TO DEVELOP

e. Mammals (dogs, cats, beavers, human beings)
   (1) have fur or hair
   (2) young are fed with milk from mother's body after birth
   (3) are warm-blooded (have a constant body temperature)
   (4) breathe air with lungs

2. Animals without backbones or internal skeletons are called invertebrates.
   a. Insects (housefly, grasshopper, mosquito, butterfly)
      (1) have six legs at some stage of life
      (2) have two feelers at some stage of life
      (3) have a body divided into three parts at some stage of life
      (4) have a hard covering on the outside of their bodies as adults
      (5) usually breathe through holes on sides of their bodies
      (6) there are many more kinds of insects than any other form of life.
   b. Other invertebrate groups include:
      (1) spiders (have eight legs)
      (2) crustaceans (crabs, lobsters; have 10 legs)
      (3) worms (flatworms, roundworms, segmented worms)

E. The Plant Kingdom is divided into two large groups:
   1. Plants that grow from seeds.
      a. flowering plants (rose, apple tree, snapdragon, daisy)
      b. non-flowering plants (pine, spruce, fir)
   2. Plants that grow from spores (ferns, mosses, algae, fungi)

F. The World of Micro-organisms. There are many kinds of tiny plants and animals that individually are too small to be seen without a microscope.
   1. Bacteria, yeasts, viruses and protozoa are some groups of micro-organisms.
   2. Some micro-organisms cause diseases, but most are harmless and others are helpful.
   3. Most micro-organisms can reproduce by dividing into two parts.
   4. Micro-organisms may be found in or on almost everything.
   5. Micro-organisms in the soil cause the decay of dead plant and animal matter.

SUGGESTED TREATMENT

TEACHER'S NOTES

Suggested Treatment:

D (1-e.) Discovered in conjunction with the story "Sharp Ears, the Baby Whale," in YOUNG EXPLORERS.

With reference to integration with social studies:

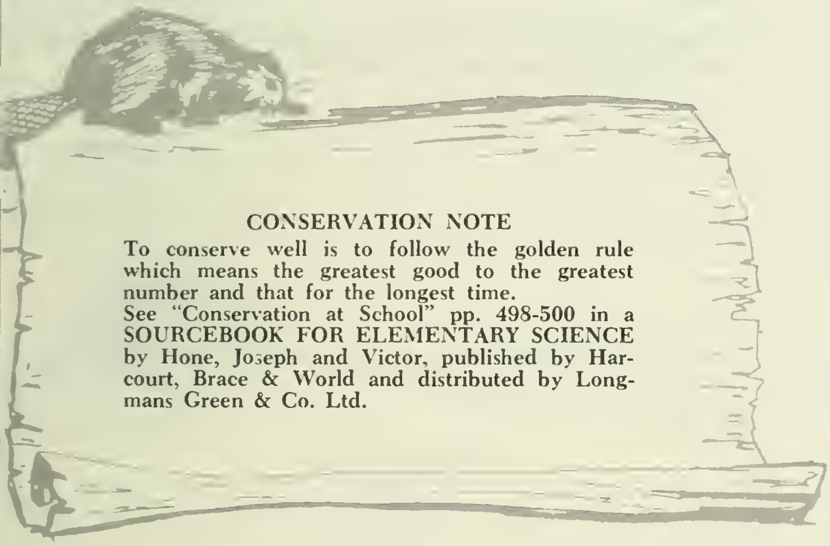
D (2) Pests which harassed the pioneers. (Pioneer Life.)

Also modern control of insect pests in contrast to pioneer times.

Suggested Activities:

1. Grow some bread moulds.
2. Examine, if possible, a bit of mould under a microscope or magnifying glass.
3. Set a bit of yeast to rise in dough. See how long the yeast works.
4. Plan a campaign to exterminate houseflies in your community.
5. Examine a number of insects, if possible under a microscope, to see legs, parts of body, etc.

Be sure to consult the teacher's edition of the authorized texts for many other excellent suggestions.



CONSERVATION NOTE

To conserve well is to follow the golden rule which means the greatest good to the greatest number and that for the longest time.

See "Conservation at School" pp. 498-500 in a SOURCEBOOK FOR ELEMENTARY SCIENCE by Hone, Joseph and Victor, published by Harcourt, Brace & World and distributed by Longmans Green & Co. Ltd.

Living Things

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts
1. Beauchamp—p. 47-66
2. Thurber—p. 97-112

Audio-Visual Aids

Films

Australian Platypus, T 1009
Blind as a Bat, Tk 1058
Mammals are Interesting, Tk 953

Filmstrips

Green Plants: Food Factories for the World, Pk 3365 (H. Brace)
Plant Factories, Pk 3488 (SVE)
The Water We Drink, Pk 2822 (YAF)

CONCEPTS TO DEVELOP

II. ALL LIVING THINGS EXCHANGE MATERIALS WITH THEIR ENVIRONMENT (WATER, FOOD, GASES)

A. Land animals use the oxygen in the air.

B. Water animals take oxygen from air dissolved in the water.

C. People need oxygen from the air for oxidation of their food. This process provides:
   1. Heat energy to keep the body warm.
   2. Energy to help the body move.

D. Green plants need air, water, warmth, minerals and sunlight to grow.
   1. Air gets into green plants through tiny openings in their leaves.
   2. Plants use oxygen from the air in order to use food.
   3. Carbon dioxide from the air is one of the materials used by plants to make food.
   4. Water is needed to dissolve food materials before plants can use them.
      a. Dissolved food materials in the soil are carried into the plant when water soaks into the roots.
      b. Sap, made mostly of water, carries food materials and food to all parts of the plant.
      c. Some plants live in or on water.

E. Water is needed to make juices that dissolve and otherwise change food so that the bodies of people and animals can use it.

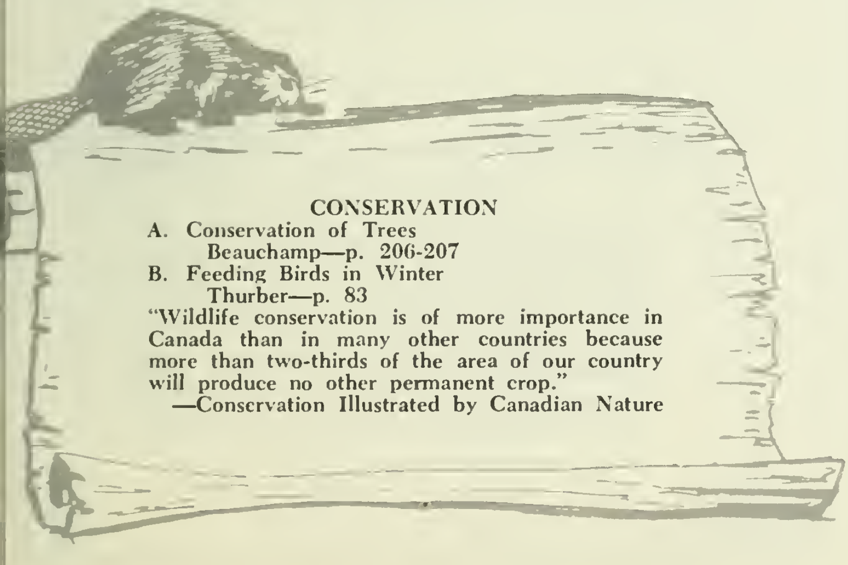
F. Water provides the liquid part of the blood, which carries food and dissolved gases throughout the body.

SUGGESTED TREATMENT

TEACHER'S NOTES

Activities:

1. Place the stem of a white flower or stalk of celery in red ink to show that the plant takes in water. Observe the changes of color in the petals of the flower or slice apart the celery stalk to see the red inside the plant.
2. Cover under sides of leaves of a plant with heavy grease. Watch to see what happens. Compare with a similar plant in which leaves have not been greased.
3. Grow plants without soil. Plant seeds in a non-nutrient material such as clean-washed sand or gravel, vermiculite, or sphagnum moss.Water, with a solution of minerals. Use commercially prepared complete plant foods such as Hyponex, Planttals or similar products. Compare with another set of seedlings grown in soil.
4. Impress upon children the fact that of all our possessions, the ones we can least do without, are air and water.



CONSERVATION

A. Conservation of Trees
Beauchamp—p. 206-207
B. Feeding Birds in Winter
Thurber—p. 83

"Wildlife conservation is of more importance in Canada than in many other countries because more than two-thirds of the area of our country will produce no other permanent crop."
—Conservation Illustrated by Canadian Nature

Grade 4

The Earth and the Universe

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 91-112
2. Craig—p. 65-105, 211-235
3. Thurber—p. 4-20, 185-200

Audio-Visual Aids

Films

Day and Night, Tk 594
The Earth in Motion, T 8
The World We Live In, T 276
What is Soil, T 810
The Making of a River, T 1076
Earth's Rocky Crust, T 197
Wearing Away the Land, T 429

Filmstrips

Day and Night, P 1115 (GBI)
The Earth, Pk 2677 (EBF)
The Earth and its Wonders Series (EBF)
  The Story of Rivers, Pk 2741
  Story of Underground Water, Pk 2742
  Story of Air, Pk 2743
  Story of Mountains, Pk 2744
  Story of Ice and Glaciers, Pk 2745
  Story of Volcanoes, Pk 2746
Hawaii: Volcanism, Pk 3714 (Gunter)
Our Earth is Round, Pk 3231 (YLP)
What is Air?, Pk 3232 (YLP)

CONCEPTS TO DEVELOP

I. THE EARTH

A. The earth

1. The earth is shaped like a ball
2. Spins on its axis once every 24 hours which causes day and night
3. Travels around the sun in 365¼ days
4. Is hot inside as shown by geysers, hot springs, volcanoes

B. The earth has a blanket of air

1. Air is an invisible, odorless, mixture of gases surrounding the earth
2. Air presses against all sides of everything it touches
3. Man has learned to use this air pressure
4. Movement of air helps to keep us comfortable

C. The soil is an important part of the earth's surface

1. Soil is essential to people
2. Soil usually forms from broken rock material
3. Water helps change rocks into soil
4. Humus makes soil better for plant growth
5. Air and water are important parts of soil
6. Many animals live in the soil

D. The earth contains rocks and minerals

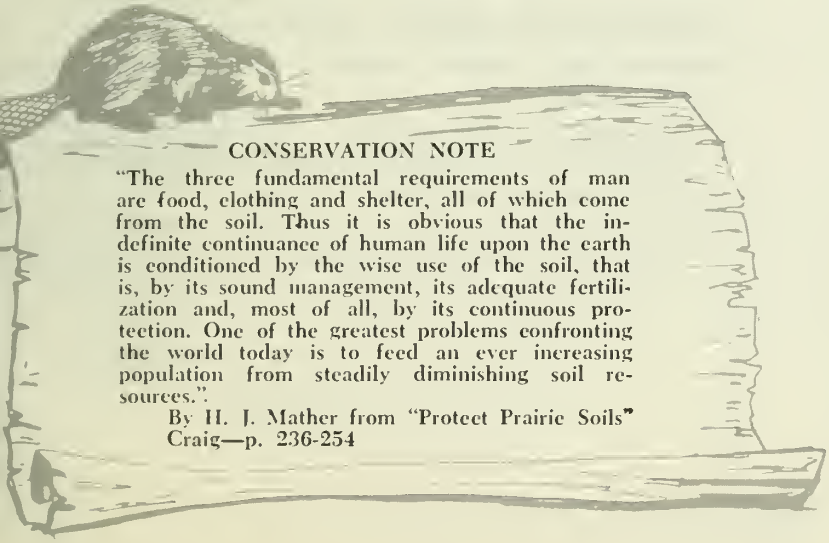
1. Rocks can tell us many things about life on the earth long ago
2. Most rocks and minerals can be identified
3. Some rocks contain valuable minerals, sometimes a few, sometimes many
4. We use rocks and minerals in many ways

SUGGESTED TREATMENT

Sections A and B can probably best be treated as science units. Sections C and D will correlate to some extent with the section " Economics and Social Life."

Activities:

1. Children may make rock collections. Rocks may be broken to see inside formation. Divide into three general categories.
2. Grind together pieces of sandstone to see how sand is made from it.
3. Grind together different kinds of rock and try to make soil. Plant some beans in regular top soil to serve as a control and compare the growth records of these bean plants.
4. Examine creeks and rivers to see how hillsides are eroding.
5. Set up a paper mache earth, sun, moon, etc.
6. Examine pictures of geysers from Yellowstone brochures, etc.

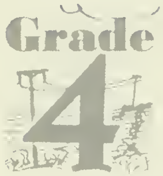


CONSERVATION NOTE

"The three fundamental requirements of man are food, clothing and shelter, all of which come from the soil. Thus it is obvious that the indefinite continuance of human life upon the earth is conditioned by the wise use of the soil, that is, by its sound management, its adequate fertilization and, most of all, by its continuous protection. One of the greatest problems confronting the world today is to feed an ever increasing population from steadily diminishing soil resources.".

By H. J. Mather from "Protect Prairie Soils"
Craig—p. 236-254

TEACHER'S NOTES



Energy and Machines

I. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Craig—p. 164-183
2. Thurber—p. 113-128

Audio-Visual Aids

Films

The Electromagnet, T 674
How Man Made Day, T 584
The Story of Electricity, T 312
Thunder and Lightning, T 729

Filmstrips

Electricity, P 1294 (YAF)
Electric Magnets, P 1482 (R. Peterson)

II. SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 67-90
2. Thurber—p. 145-158, 159-172

Audio-Visual Aids

Filmstrips

Energy Foods, P 2006 (Br. Min. of Foods)
How We Get Our Coal, P 1429 (YAF)
Natural Gas in Alberta, Pk 3691 (CWNG)
Your Bones and Muscles, P 1607 (J. Handy)
Your Heart and Lungs, Pk 1608 (J. Handy)
Your Muscles, Pk 2176 (Curr.)
Your Posture, Good or Bad, P 913 (YAF)
What Makes an Airplane Fly, Pk 3445 (J. Handy)

Films

Posture Habits, T 559
Six Slices a Day, T 229
The Skeleton, T 1255

CONCEPTS TO DEVELOP

I. ELECTRICITY

A. Some interesting facts about static electricity.

1. Many objects can be given electrical charges by rubbing them.
2. Charged objects have electrical energy.
3. Charged objects attract uncharged objects.
4. Charged objects repel other objects with the same charge.
5. Charged objects attract other objects with different charges.
6. A spark results when an electrical charge jumps through the air.
7. Lightning is an enormous electrical spark.
8. Thunder results when this huge spark goes through the air.

B. Making electricity work for man is a fairly recent and very significant development.

1. Electricity is used every day in many ways.
2. The electric current coming into buildings is powerful and can produce a dangerous shock.
3. It is safe to work with dry cells because they have low electrical pressure (voltage).
4. Some objects are good conductors of electricity, and others are poor conductors (semi-conductors) or non-conductors.
5. Non-conductors are used as insulators to prevent short circuits.
6. Electromagnets are made by using electricity.
7. Electromagnets are used by man in many ways because they can be turned on or off.
8. Learning to use electricity safely is very important.

II. OUR BODY IS A MACHINE

A. Our body resembles a machine in a number of ways.

1. Muscles make part of our body move.
2. Our bones and joints are levers.
3. Foods provide energy.

III. MACHINES HELP MAN

A. Machines make available sources of energy that assist man in many ways.

1. Air pressure aids in aviation.
2. Compressed air is used as a source of power.
3. Many machines use electrical energy.
4. Coal, petroleum and natural gas are important sources of energy. (Point out that these fuels are unrenewable resources.)

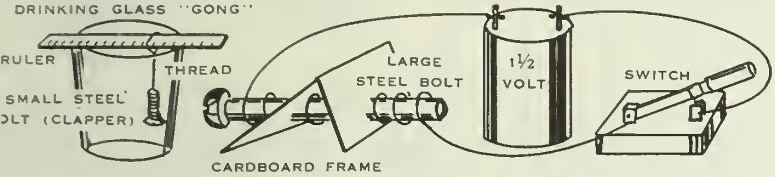
SUGGESTED TREATMENT

TEACHER'S NOTES

Sections A and B may be handled as separate units. Section A permits many experiments.

I. *Activities:*

1. If possible see how a new house is being wired for electricity. Note where meters, fuses and house switches are installed. Learn what precautions are taken to prevent fires.
2. Make a simple electromagnet.
3. Make a working model of an electric gong.



When the switch is closed, the large steel bolt becomes an electromagnet and attracts the small bolt hanging within the drinking glass. By carefully adjusting the distances between the bolts and the glass, the small bolt can be made to hit the glass and produce a gentle chime. The stronger the electromagnet, the better the gong will work.

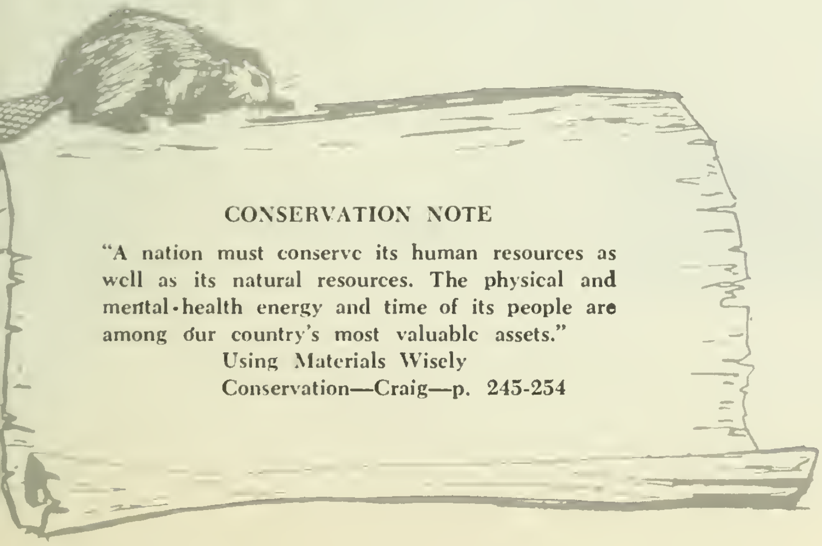
CONSERVATION NOTES

Safety Rules for Your Pupils

1. Never touch electrified wires or use a cord on which the covering is worn.
2. Keep electric wires and cords from rubbing against things.
3. Stay away from broken wires hanging from poles or buildings.
4. Never climb a pole that supports electric wires.
5. Never touch an electric cord while hands are wet or while touching a water pipe, radiator or faucet.

II. *Experiments:*

1. Children may have two white rats or guinea pigs in separate cages. They may start on different diets to determine the value of milk, sugar, fats, etc. e.g., one rat may receive whole wheat bread and water and the other receive whole wheat bread and milk. When observable differences are noted then reverse the experiment and control animals.
2. See a small gasoline engine at work. Make simple diagrams to show compressed air, electricity, gas, etc.



CONSERVATION NOTE

"A nation must conserve its human resources as well as its natural resources. The physical and mental-health energy and time of its people are among our country's most valuable assets."

Using Materials Wisely
Conservation—Craig—p. 245-254

TEACHER'S NOTES:

Pupils are experimenting with growing plants from seeds, cuttings, etc.

Grade Five

Living Things

Authorized Science Readers

Beauchamp—Discovering Our World Bk. II

Craig—Adventuring in Science

Thurber—Exploring Science Bk. V

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Animals
   - a. Craig—p. 129-160
   - b. Beauchamp—none (Gr. IV, p. 183-214)
2. Plants
   - a. Beauchamp—Gr. IV, p. 183-214
   - b. Craig—p. 4-23
   - c. Thurber—p. 199-222, 271-290

Audio-Visual Aids

Filmstrips

Conserving Forest Resources, Pk 2452 (Curr.)
Conserving Wildlife Resources (Curr.)
Flowers, Fruits and Seeds, Pk 3280 (SVE)
How Plants Grow and Reproduce, Pk 3279 (SVE)
Mushrooms, Pk 3699 (SVE)
Parts of a Flowering Plant, Pk 2798 (Curr.)
Plant Life and the Soil, Pk 1536 (EBF)

Films—Birds of Canada

No. 1—Kingbird, bluebird, cuckoo, Tk 98
No. 2—Waxwing, robin, vireo, Tk 867
No. 3—Killdeer, nighthawk, waxwing, Tk 868
No. 4 & 5—Sandpiper, bluebird, Tk 869
No. 6—Woodpecker, sapsucker, loon, Tk 870
Birds at the Seashore, Tk 944
Development of the Chick Embryo, Tk 982
Forest Tent Caterpillar, Tk 1199

CONCEPTS TO DEVELOP

WHERE DO PLANTS AND ANIMALS COME FROM AND HOW DO THEY GROW?

I. ANIMALS

A. Most mammals give birth to living young.

1. Mammals grow from a very tiny fertilized egg.
2. Because they develop inside the mother's body, mammals give birth to very few young at one time.
3. During their development, mammals are well protected inside the mother's body.
4. Most mammal parents care for their young.

B. Birds hatch from eggs.

1. Eggs contain yolk which is food for the developing bird before it hatches.
2. The adults of most kinds of birds care for their young.
3. Bird eggs require warmth to be hatched. In many cases the adult birds supply this warmth from their own bodies by sitting on the eggs.

C. Amphibians hatch from eggs.

1. The eggs of amphibians do not have shells.
2. Such eggs are laid in water and fertilized by the male.
3. They develop without further care by the adults.
4. Amphibian young (tadpoles) do not resemble their parents, until they develop into the adult stage.

D. Many reptiles hatch from eggs.

1. The eggs of reptiles have a leathery covering instead of a brittle shell.
2. Reptile eggs are usually laid on land where the young are born alive.
3. In a few kinds of reptiles, the eggs hatch inside the mother and the young are born alive.
4. Snakes shed their skins as they grow bigger, and grow new ones.

E. Most fish hatch from eggs.

1. Fish eggs are laid in great numbers at one time.
2. Fish eggs do not have any shell-like covering.
3. Most kinds of fish do not take care of their young.
4. Very few of all the eggs produced survive after development to grow to adults. They provide food for other forms of water life.
5. In some kinds of fish, the eggs hatch within the mother's body and are born alive.

F. Insects hatch from eggs.

1. Many insects lay great numbers of eggs at one time.
2. Insect eggs usually have a hard protective covering.
3. Very few of all the eggs produced by an insect survive to adult stages.
4. Insects go through different stages from young to adults.
   - a. Moth and butterfly eggs hatch and produce caterpillars; caterpillars spin a cocoon or chrysalis inside of which they develop as an adult with wings. The adult moth or butterfly comes out of the cocoon or chrysalis in the spring.
   - b. When grasshopper eggs hatch the young resemble the adults except that they are much smaller. As they grow larger, they moult or shed their outer covering several times until the adult stage is reached.

SUGGESTED TREATMENT

TEACHER'S NOTES

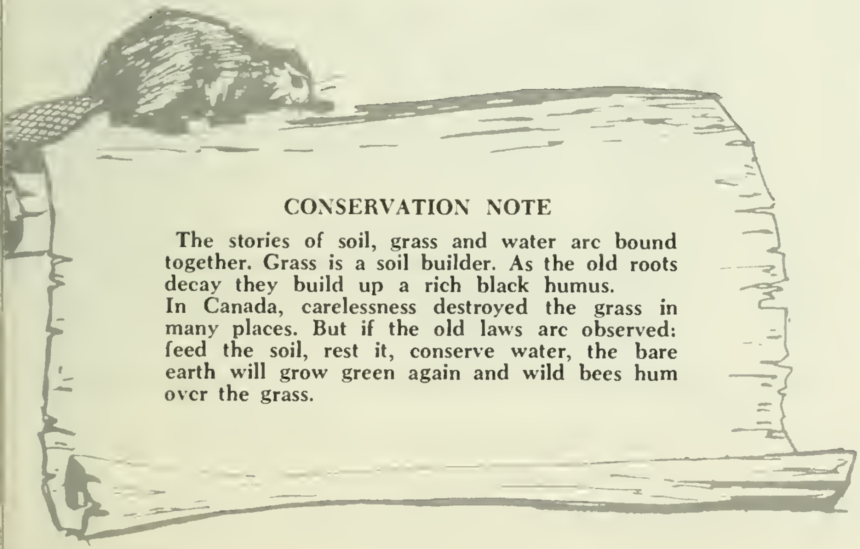
Review Section on Seasons. Craig, pp. 45-63.

Where Do New Plants and Animals Come From and How Do They Grow?

Children should be taught to observe and appreciate nature, not to destroy or molest it. For example, the collecting of wild birds' eggs should be discouraged and the taking of nature photographs encouraged.

Suggested Activities for Science Teaching Unit on *Section I:*

1. Where local conditions are suitable, trips to a wild-life sanctuary, a zoo, a fish or an egg hatchery will stimulate interest in animals.
2. Make an incubator from a sturdy box and hatch some chick eggs. Use a small light bulb as heat source. (See "A SOURCEBOOK FOR ELEMENTARY SCHOOL SCIENCE," Hone et al, pp. 13-14.)



CONSERVATION NOTE

The stories of soil, grass and water are bound together. Grass is a soil builder. As the old roots decay they build up a rich black humus.
In Canada, carelessness destroyed the grass in many places. But if the old laws are observed: feed the soil, rest it, conserve water, the bare earth will grow green again and wild bees hum over the grass.

Grade 5

Living Things

CONCEPTS TO DEVELOP

G. Other animal groups:

1. Spiders
   - a. Often produce many eggs inside of a large egg case.
   - b. Many young spiders develop inside the egg case and hatch out at about the same time.
   - c. Spiders shed their outer covering several times as they grow.
2. Crustaceans
   - a. These animals produce many eggs at one time.
   - b. The eggs hatch into free-swimming young that go through various stages to adult form.
   - c. Eggs of crustaceans do not have any shell-like covering.
   - d. Some crustaceans can regrow parts of their body such as legs or claws.

H. The fewer young produced the greater parental care is usually exercised.

1. Producing many young out of which a few survive to adulthood is one kind of protection some animals have developed to carry on their kind.
2. Producing very few young that are cared for by the parents is another kind of protection some animals have developed to carry on their kind.
3. Care of the young for maximum survival is carried out most effectively by human beings in family and school life.

II. PLANTS

A. Some plants grow from seeds.

1. Plants produce seeds before they die. In the spring these seeds begin to grow into new plants.
2. The flower is a plant's seed-producing organ.
3. Flowers contain tiny eggs that are fertilized by pollen to form the living part of a seed.
4. The wind and nectar-collecting insects transfer pollen from one flower to another and make seed-formation possible in some kinds of plants.
5. The seeds of many plants are scattered by the wind and carried by many kinds of animals to places where they may grow.
6. A seed contains an embryo plant and some food, and is usually surrounded with a tough coat or shell.
7. In the presence of water, air and warmth the young plant inside a seed starts to grow.
   - a. Food that is stored in the seed is used by the young plant until it grows green leaves.
   - b. The green leaves are the food-making organs of the plant.
   - c. One part of the young plant grows above ground to become the stem and leaves; another part grows below ground to form the root system.
   - d. Water and minerals in the soil enter the plant through the roots.

B. Some plants may be grown from parts other than their seeds.

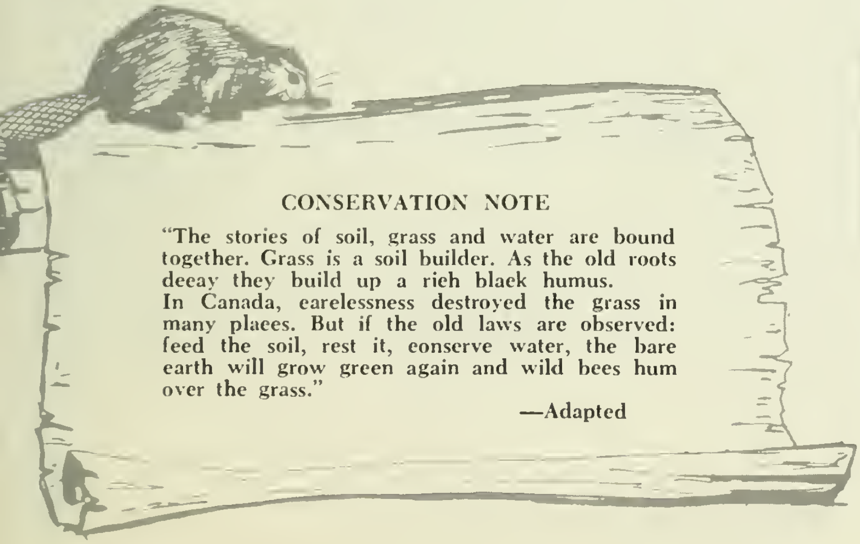
1. A piece of such plants grow to form an entire plant.
2. Some plants grow from roots.
3. Some plants grow from pieces of stems and leaves called cuttings.

SUGGESTED TREATMENT

Suggested Activities:

1. Raise a "garden" of non-green plants (yeasts, molds, bacteria). (See "A Sourcebook for Elementary School Science," pp. 66-70.)
2. Discuss purposes of grafting to obtain new varieties of apples, pears, etc. Try to graft a bud or branch on to a tree. Examine pictures and read instructions so that the graft will be successful.
3. Find out which crops provide better root systems to hold the soil and prevent erosion. Make reports on these.
4. Find out the number of inches of rainfall which occur annually in your district, the average number of hours of sunshine and the mean temperature.
5. Examine wheat, oats, etc., to see "germ," bran, etc.
6. Collect samples of seeds with wings, burrs, seed pods that pop open. Examine a poppy's "seed box." Find some tumble weed.

TEACHER'S NOTES



CONSERVATION NOTE

"The stories of soil, grass and water are bound together. Grass is a soil builder. As the old roots decay they build up a rich black humus.
In Canada, carelessness destroyed the grass in many places. But if the old laws are observed: feed the soil, rest it, conserve water, the bare earth will grow green again and wild bees hum over the grass."

—Adapted

Living Things

CONCEPTS TO DEVELOP

4. Some important farm crops are grown from parts of plants other than seeds, e.g., potatoes.
5. In grafting, a bud or a branch of one kind of plant can be made to grow on the stem of a different plant.

C. Plants that do not form seeds such as molds, mushrooms and ferns grow from spores.

1. A mold or mushroom plant produces millions of dust-like spores.
2. The tiny spores can be carried many miles by the wind.
3. Each spore can grow into a complete new plant.
4. Microscopic plants (bacteria, yeast, etc.) reproduce by dividing into two or more parts. Each part grows to become a complete organism.
5. Micro-organisms multiply very quickly since their number doubles each time they reproduce.

III. WHERE PLANTS GROW

A. Interesting relationships between plants and environment.

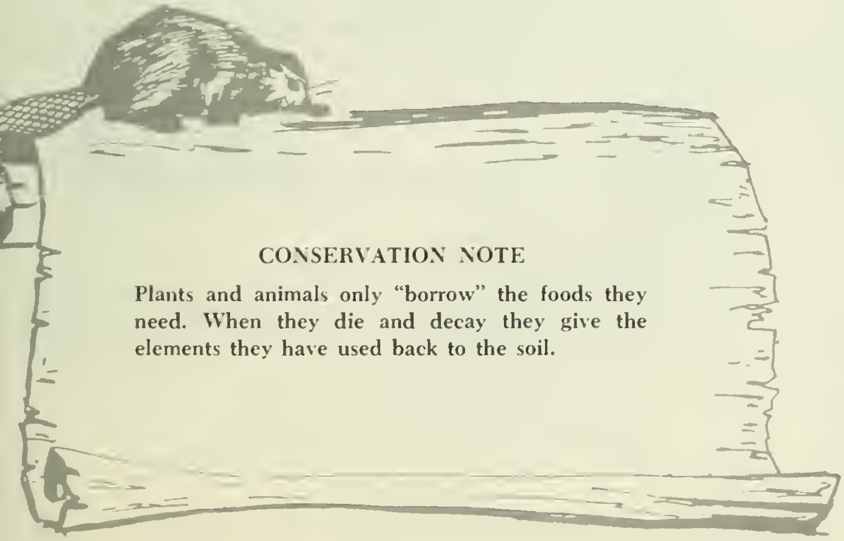
1. Physical conditions of heat, light, air and moisture determine what kinds of plants can grow in a region.
2. Some animals use plants as food.
3. The roots of some plants hold the soil in place and keep it from being blown away by the wind.
4. A weed is any plant growing where it is not wanted.

SUGGESTED TREATMENT

TEACHER'S NOTES

Suggested Activities:

1. Have class sprout seeds in paper cups. Place all of these in a shallow tray containing a little water to keep the soil in the cups from drying out.
2. Collect seeds of various plants. Classify according to manner in which dispersal takes place.
3. Start new plants in a variety of ways: from cuttings, from leaves, etc.
4. Report on methods used for weed control on the farm.
5. Examine seed producing part of flowers such as nasturtium, pansy, sweet peas, etc.
6. Take all leaves off a thriving plant and see what happens to it.
7. Examine a variety of roots of plants to locate fibrous root, tap root, etc. Find out which plants and which roots hold soil best and which plants (crops) do least to hold the soil.



CONSERVATION NOTE

Plants and animals only "borrow" the foods they need. When they die and decay they give the elements they have used back to the soil.

The Earth and the Universe

SOURCES OF INFORMATION FOR YOUR PUPILS

A. Texts

Beauchamp—Gr. VI, p. 187-210
Gr. IV, p. 113-134
Craig—p. 65-95, Gr. VI, p. 99-117
Thurber—p. 137-154

Audio-Visual Aids

Films

The Solar Family, T 28
This is the Moon, T 730
The Sun's Family, T 932
The Moon, T 209
How Many Stars, T 1053
Exploring Space, T 255

Filmstrips

The Earth as a Planet, P 1006
The Earth in Space, P. 3338 (SVE)
The Sky Series (J. Handy)
- A Multitude of Suns, P 251
- Stories of the Constellations, P 252
- The Sun's Family, P 253
- Interesting Things About the Planets, P 254
- Our Neighbour the Moon, P 255
- The Changing Moon, P 256
- How We Learn About the Sky, P 257

B. Texts

Beauchamp—p. 187-210
Gr. IV, p. 113-134
Craig—p. 65-95, Gr. VI, p. 99-117
Thurber—p. 137-154

Audio-Visual Aids

Filmstrips

The Earth in Space, Pk 3338 (SVE)
The Earth is Born, Pk 2028 (Life)
How Our Earth Began, Pk 2192 (Curr.)
The Sun and its Family, Pk 3810 (SVE)
The Sun and its Planets, Pk 3339 (SVE)

CONCEPTS TO DEVELOP

I. WHAT IS THE UNIVERSE LIKE?

A. Solar System
1. We could not live without the sun. Without it we would not have:
   a. heat
   b. any light
   c. any food
   d. any energy
2. The sun is the center of our solar system which contains:
   a. nine known planets
   b. the planetoids
   c. satellites
3. The planets vary in size, distance from the sun, speed of revolution and number of moons.
4. Each of these revolves around the sun in a fixed path called an orbit.
5. Each planet at the same time rotates on its axis.
6. Planets are held to their orbit by opposing forces.
7. The movements of the solar system are regular and exactly predictable.
8. While there is no proof of the existence of life on any planet but the earth, conditions favorable to life do exist on some other planets.

B. What are comets?
1. Comets are made up of gases and little bits of solids.
2. The orbits of comets and planets often cross.

C. What causes an eclipse?
1. An eclipse of the sun is caused by the moon passing between the earth and the sun.
2. An eclipse of the moon is caused by the earth passing between the moon and the sun.

D. What is beyond the solar system?
1. Beyond our solar system are uncounted numbers of suns (stars) and perhaps other solar systems.
2. Distances between stars are so vast that scientists measure them in light years.
3. A light year is the distance that light travels in one year.

E. The birth of our earth.
1. Theories re the formation of the earth.
2. Ice-ages
3. Forces of erosion } the process of building
4. Mountain building } up and tearing down.
5. Layers of the earth
6. Formation of soil
7. Man's effects on the soil. (Man has speeded the process of erosion so that top soil is wearing away much faster than it is being built up.)

SUGGESTED TREATMENT

Suggested Activities:

1. Field Trips
   - A. Plan a "star-party" or somehow motivate pupils' observations of the constellations.
   - B. Visit university observatory where possible.
   - C. Invite interested amateur astronomers to talk to the class.
2. Experiments
   To show:
   - A. Why the earth stays in its orbit.
   - B. How the moon can cause an eclipse of the sun. Use flashlight, orange and ball.
   - C. Day and night.
   - D. Roundness of the earth.
   - E. Motion of the earth.
   - F. Erosion—watch water going down a drain.
   - G. Seasons and angles of light rays.
3. Discussion
   - A. If life exists on other planets, then man should take care that his rocket ships do not transmit alien organisms either to or from the other planets.
   - B. Might this still be a problem if life does not exist on the planets which man visits?

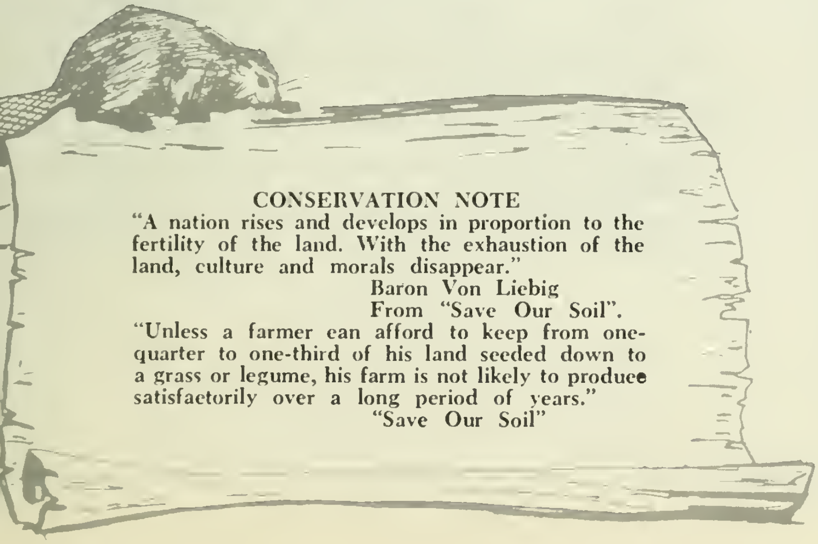
CONSERVATION NOTE

"If civilization is to escape decline or perhaps destruction it must change from an economy of exploitation to an economy of conservation. Effective conservation education is imperative. To this challenge the schools must give their best."

Adapted from Better Living
Through Wise Conservation of Resources

Activities for Sections D and E:

1. Explain how stars rise and set, due to rotation of the earth.
2. Encourage the construction of sky maps for the month. Keep them throughout a season of three months for comparison.
3. Field trips to examine evidence of erosion, formation of rock, profiles of soil at road cuts. See number of inches of topsoil, subsoil.



CONSERVATION NOTE

"A nation rises and develops in proportion to the fertility of the land. With the exhaustion of the land, culture and morals disappear."

Baron Von Liebig
From "Save Our Soil".

"Unless a farmer can afford to keep from one-quarter to one-third of his land seeded down to a grass or legume, his farm is not likely to produce satisfactorily over a long period of years."

"Save Our Soil"

TEACHER'S NOTES

Grade

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Beauchamp—p. 121-156
Craig—p. 202-225, Gr. IV, p. 164-183
Thurber—p. 155-178, Gr. VI, p. 180-200

Audio-Visual Aids

Films

Home Electrical Appliances, T 99
Primary Cell, T 93
Sources of Electricity, T 42
The Story of Electricity, T 312
What is Electricity, T 1114

Filmstrips

Electricity, P 1294 (YAF)
Electric Magnets, P 1482 (SVE)
Benjamin Franklin, Pk 2475 (Curr.)
Understanding Electricity Series (J. Handy)
  What is Static Electricity?, Pk 3598
  What is Current Electricity?, Pk 3599
  How Most Electricity is Produced, Pk 3600
  Producing Small Amounts of Electricity, Pk 3601
  Electromagnets and How They Work, Pk 3602
  How Electricity is Used in the Home, Pk 3603
  Using Electricity Safely, Pk 3604

CONCEPTS TO DEVELOP

I. ELECTRICITY: PRODUCTION AND CONTROL

A. Where electric current comes from:
  1. Electric current can be produced by chemical change in a dry cell or wet cell. Use of diagrams to explain working but not actual chemical reactions.
  2. Electric current can be produced by generators that use the energy of water, wind, steam, or exploding gases. Explanation that electricity comes from wire turning in a magnetic field, without going into the reason for this.

B. Static electricity:
  1. How lightning is produced.
  2. Protection from lightning—lightning rods.
  3. Static electricity in trucks and airplanes.

C. How electric current flows:
  1. Electric current will flow only if there is a closed circuit.
  2. Proper use of electrical appliances to avoid danger.
  3. How light bulbs and sockets work—diagrams.
  4. How neon and fluorescent lights work.

D. Why electric wires are insulated:
  1. Cause and result of short circuits.
  2. Prevention of short circuits—fuses and circuit breakers.
  3. Electric wires are extremely dangerous if not properly insulated.

E. How electric current is controlled:
  1. Closing and opening a circuit by using various types of switches.
  2. Making a circuit stronger and weaker by using a transformer or more and fewer cells.

F. How electric current is used to produce heat:
  1. Poor conductors become hot when current is passed through them.
  2. How this is used in certain appliances.

G. How electric current gives us light:
  1. Some poor conductors become so hot that they give off light.
  2. Some light is made with gases that glow when electric current flows through them.

H. How electric current is used to make a magnet:
  1. Current is passed through wire wound around iron or steel.
  2. Use of the electromagnet to produce motion—electric motor.

SUGGESTED TREATMENT | TEACHER'S NOTES

Integrations:

This unit can be integrated with social studies section on Economics and Social Life. Such a unit as "Electricity: Production and Control" could well form part of a technical study of industrial advancement which would introduce and form a basis for a social and economic study.

Activities:

1. Experiment to produce static electricity—rubbing a comb through a silk handkerchief; combing your hair in a dark room facing a mirror, and watching for sparks.
2. Set up a closed circuit for an electrical light bulb. Examine the socket of an old lamp.
3. Find out how lightning rods work. Examine a set if possible, and see how electricity is grounded.
4. Find out how an electric bell works.
5. Find out whether an electromagnet has a north and south pole.
6. Find out and observe how an electromagnet can turn a motor.
7. Make a simple telephone.
8. Find out why carbon is used in a simple transmitter.

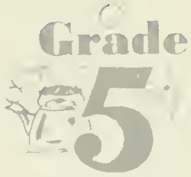
CONSERVATION NOTE

Human conservation is concerned with the life, health, and safety of each individual. Electrical appliances should not be touched when hands are damp or when a person is in a bathtub. Occasional carelessness in handling electrical appliances causes destructive fires or fatal electric shock.

9. Field Trips
    - A. Visit a generating plant.
    - B. Visit a telegraph office.
    - C. Visit a telephone exchange.
    - D. Inspect electrical systems in the school.
10. Experiments and Demonstrations (Choose some suitable ones.)
    - A. Find out what is inside a dry cell.
    - B. Make a wet cell and show how it works.
    - C. Show that electricity flows only in a closed circuit.
    - D. Show why wires are insulated.
    - E. Find out what a short circuit is.
    - F. Show that wires are heated when a short circuit takes place.
    - G. Find out how an electric current is changed to heat.
    - H. Observe the heating element in an electric iron.
    - I. See what an electromagnet will attract.
    - J. See how the force of an electromagnet can be controlled. Note that this is related to the principle of the circuit breaker.

CONSERVATION NOTE

Electricity is made through use of some natural resource. Electricity makes possible our way of life. Whenever possible we must replace the resources we use in order that we may continue to have an abundant life.



Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Beauchamp—p. 103-122
Craig—p. 24-43
Thurber—p. 93-112, Gr. VI, 251-276

Audio-Visual Aids

Films

Distributing Heat Energy, T 74

Filmstrips

Fuels and Heat, P 1385 (EBF)
How Heat Causes Expansion, Pk 3592 (J. Handy)
How Heat Travels, Pk 3593 (J. Handy)
Wonders of the Steam Engine, Pk 2878 (Eyegate)

CONCEPTS TO DEVELOP

II. EFFECT OF HEAT AND COLD ON MATERIALS

A. **Heat travels.**
   1. Some things conduct heat better than others—air, metal, wood, etc.
   2. This knowledge is applied in insulation.

B. **How do heating and cooling change the size of solids?**
   1. Heating makes most solids expand or get larger.
   2. Cooling makes most solids contract or get smaller.

C. **What happens to liquids when they are heated or cooled?**
   1. Heating makes most liquids expand.
   2. Cooling makes most liquids contract.
   3. When liquids expand they become lighter.
   4. Warm water is pushed upward by the colder, heavier water, which sinks.

D. **How is hot water used to heat a house?**
   1. Gases expand when heated.
   2. Gases contract when cooled.
   3. Gases become lighter when they expand.
   4. Cold air sinks and pushes warm air upward.

F. **How does a hot air furnace work?**
   1. Hot air can be used to heat a house.

G. **How are solids changed to liquids?**
   1. Different solids melt at different temperatures.
   2. The temperature at which a solid melts is called its melting point.
   3. Ability to make alloys and shape metals.

H. **How are liquids changed to gases?**
   1. When a liquid boils, it changes to a gas.
   2. Different liquids boil at different temperatures.
   3. The temperature at which a liquid boils is called its boiling point.
   4. A liquid does not get any hotter than its boiling point.

I. **How is water vapor changed to liquid water?**
   1. Gases change to liquid or condense when they are cooled.
   2. Water vapor in the air condenses if the air is cooled enough.

J. **All materials are either solid, liquid, or gas.**
   1. Materials change their form with sufficient change in temperature; e.g., water, carbon dioxide, iron, etc.

SUGGESTED TREATMENT

TEACHER'S NOTES

Integrations:

a. This unit may best be handled in a survey fashion as a part of "What is the Universe Like?" In this case it is used as a basis for explaining the cooling of the earth, erosion, etc., in part E of that section.

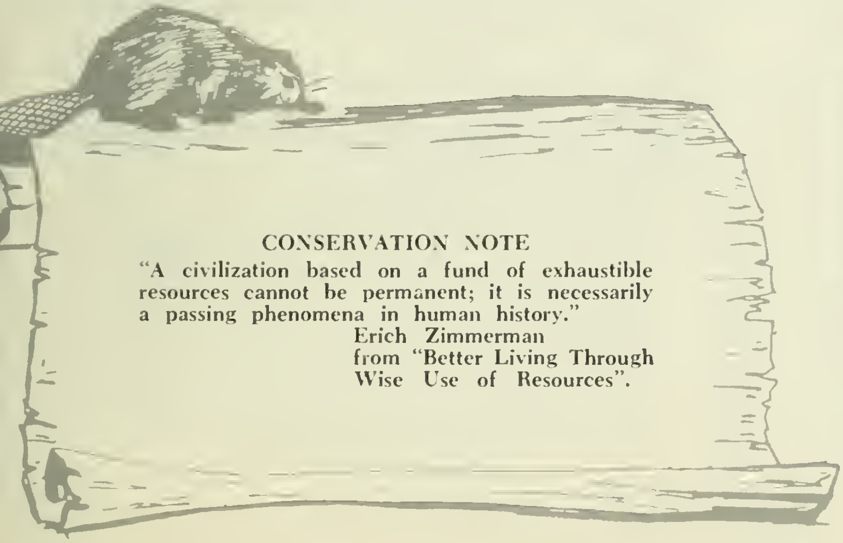
b. This unit might also form part of the social studies section on geography, used as a basis for explaining the causes of air and ocean currents.

Activities:

1. **Field Trips**
   A. Visit schools' heating plant.
   B. Visit area showing how water has eroded rock.

2. **Experiments**
   A. Find out what heat does to solids.
   B. Find out what happens to liquid when it is heated and cooled.
   C. Show that variance of heat expands and contracts air.
   D. Show that air has weight.
   E. Show how air currents are caused.
   F. Find out if air is warmer near the ceiling.
   G. Show how air currents move in a room.
   H. Observe that different solids have different melting points.
   I. Find the melting point of ice.
   J. Show that heat makes liquids evaporate faster.
   K. Show that some liquids evaporate faster than others.
   L. Use ice to show H_2O passing through the three physical stages of solid, liquid and gas. (Many other materials pass through these stages.)

Be sure to consult the teacher's edition of the authorized texts for further excellent suggestions.



CONSERVATION NOTE

"A civilization based on a fund of exhaustible resources cannot be permanent; it is necessarily a passing phenomena in human history."

Erich Zimmerman
from "Better Living Through
Wise Use of Resources".

Grade 5

Energy and Machines

CONCEPTS TO DEVELOP

III. WHAT ARE THINGS MADE OF?

A. **How are materials different from each other?**
   1. Every kind of material has its own characteristics.
   2. The use of a material depends on its characteristics.

B. **How can we change the characteristics of materials?**
   1. Physical change is a change of characteristics without making a new material.
   2. Chemical change is a change of characteristics in which an entirely new material is produced.

C. **What are elements?**
   1. All materials are made up of elements.
   2. An element is the simplest kind of material; it is made only of itself.
   3. There are more than 100 known elements.
   4. Elements can be solids, liquids or gases.
   5. Interesting facts about elements, Oxygen, Hydrogen, Helium, Mercury, Carbon, Carbon Dioxide, Atom Bombs, Radio Activity.

D. **What are compounds?**
   1. Elements combined in chemical change to make compounds.
   2. These compounds are an entirely new material.
   3. There are a large number of compounds.

E. **What are molecules?**
   1. The smallest possible particle of most substances is a molecule.
   2. Each kind of element and each kind of compound consists of only one kind of molecule.
   3. How we see molecules (electron microscopes).
   4. Molecules move (evaporation, osmosis, etc.).
   5. Heat makes molecules move faster.

F. **How do we use chemical changes?**
   1. We use chemical changes to produce new material with the gain or loss of heat.

G. **Prevention of harmful chemical changes.**
   1. Harmful chemical changes can be prevented by:
      a. keeping the elements apart
      b. keeping some materials dry
      c. keeping some materials cool
      d. keeping some materials out of the light

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Beauchamp—p. 125-143
Craig—p. 110-127

Audio-Visual Aids

Films

Oxygen, T 560
Properties of Water, T 587
The Wonder of Chemistry, T 807

Filmstrips

Chemical Change, Pk 2683 (EBF)
What is Chemistry, Pk 2032 (McG. Hill)

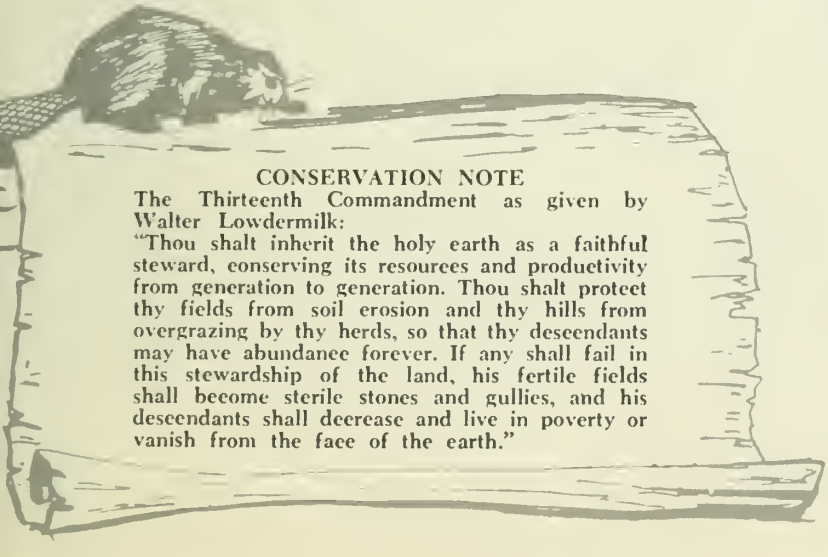
Integrations:

This unit is, perhaps, best taught as a separate science unit. It does, however, have obvious relations which suit it well to a parallel activity motivated at such places as in the science and technology section, in the study of how the earth was formed in science Unit B-1 ("The Earth and the Universe"). The children can become very fascinated with this unit—especially if they are allowed to perform experiments themselves.

Suggested Activities:

1. **Experiments**
    - A. Observe the characteristics of materials.
    - B. Show that litmus paper is an acid indicator.
    - C. Show chemical change in starch.
    - D. Show chemical change by heating sugar.
    - E. Show the difference between a mixture and a compound.
    - F. Show that moisture brings about the rusting of iron.
    - G. Produce a chemical change by adding water to baking powder.
    - H. Produce a chemical change by heating sulphur and powdered iron.
2. **Displays**

   Make displays showing: examples of elements and compounds, elements which make compounds (e.g., the compound sugar is composed of the elements carbon, hydrogen and oxygen), safety rules for experiments, pictures of compounds in industry, physical changes as compared to chemical changes, etc.



CONSERVATION NOTE

The Thirteenth Commandment as given by Walter Lowdermilk:

"Thou shalt inherit the holy earth as a faithful steward, conserving its resources and productivity from generation to generation. Thou shalt protect thy fields from soil erosion and thy hills from overgrazing by thy herds, so that thy descendants may have abundance forever. If any shall fail in this stewardship of the land, his fertile fields shall become sterile stones and gullies, and his descendants shall decrease and live in poverty or vanish from the face of the earth."

Grade

5

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Beauchamp—p. 149-168
Craig—no reference
Thurber—p. 25-48

Audio-Visual Aids

Filmstrips

Flashy the Firebug, Pk 2563 (NFB)
Science of Fire Prevention, Pk 1999 (with record if desired) (NFB)

Film

Safety in the Home, T 77

CONCEPTS TO DEVELOP

IV. HOW DO WE CONTROL FIRE?

A. Materials to make a fire.

1. We need these three things to make a fire:
    - a. combustible material
    - b. enough heat to raise the material to its kindling temperature.
    - c. air near the material.
2. Heat to start a fire may be produced with friction.
3. Matches help us light fires easily, but they must be used with care.

B. What happens when things burn?

1. When any material burns, it gives off heat and light and becomes smaller.
2. When any material burns a chemical change takes place.
    - a. carbon contained in material combines with oxygen to form carbon dioxide
    - b. hydrogen contained in material combines with oxygen to form water
    - c. minerals are left as ashes
    - d. if enough oxygen is not present the carbon remains uncombined as smoke

C. How can we conserve our fuels?

1. We must conserve our coal, oil, gas, etc., because these supplies won't last forever and cannot be replaced.
2. Fuels may be conserved by using them carefully.
3. Fuels may be conserved by using new kinds of fuels or other sources of energy.

D. What can we do to prevent fires?

1. Accidental fires can be avoided by preventing the three things needed for burning from coming together.

E. How can we put out fires?

1. Fires should be reported to the fire department promptly.
2. Fires can be put out by removing one or more of the things needed for burning.

Integrations:

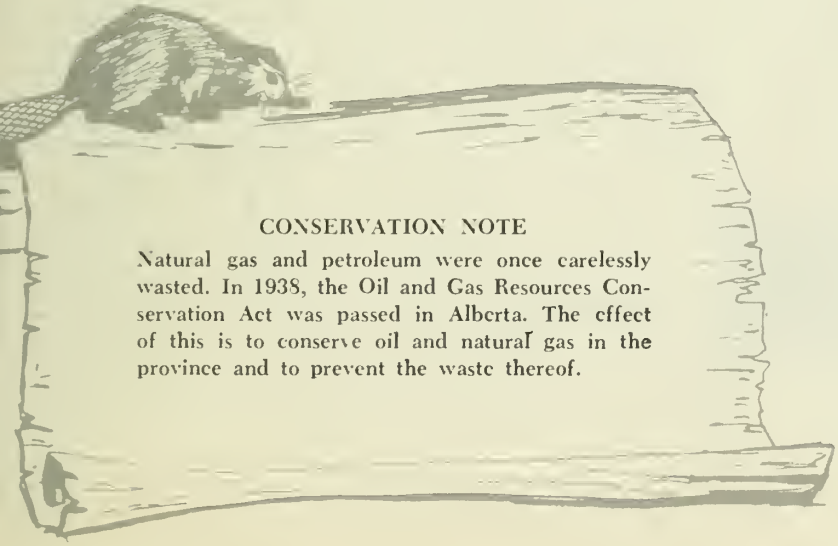
A. This unit might be handled as a separate science unit. Done as a quick survey it would be very appropriate during fire-prevention week.

B. It could be integrated with a study of Canada's forest industries under the social studies section on Economics and Social Life.

Suggested Activities:

1. **Field Trips**
    A. Visit local fire station.
    B. If possible, visit forest-ranger station.
    C. Examine school fire alarm and fire fighting apparatus.

2. **Experiments**
    A. Show that a fire must have air in order to burn.
    B. Show that materials need oxygen in order to burn.
    C. Show what happens when a candle burns.
    D. Show that carbon dioxide is formed by burning.
    E. Show that water is formed by burning.



CONSERVATION NOTE

Natural gas and petroleum were once carelessly wasted. In 1938, the Oil and Gas Resources Conservation Act was passed in Alberta. The effect of this is to conserve oil and natural gas in the province and to prevent the waste thereof.

TEACHER'S NOTES:

A well-organized science display in a Grade VI room.

Grade Six

Grade 6

Living Things

Authorized Science Texts
Discovering Our World, Bk. 3—Beauchamp

Experimenting in Science —Craig

Exploring Science, Bk. VI —Thurber

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts
Section I
1. Beauchamp—p. 241-266
2. Craig—p. 145-187
3. Thurber—p. 210-211, 314-415

Enrichment
Fish Life—Thurber—p. 229-324

Audio-Visual Aids

Films
The Fossil Story, Tk 934

Filmstrips
Age of the Mammals, Pk 2117 (Life)
Animals of Long Ago, Pk 2197 (Curr.)
Dinosaurs, P 1597 (NFB)
How Life Began, Pk 2196 (Curr.)
Man of Long Ago, Pk 2253 (Curr.)
Reptiles Inherit the Earth, Pk 2142 (Life)
The Story Fossils Tell, Pk 3035 (EBF)

Texts
Section II
1. Beauchamp—p. 241-268
2. Craig—p. 144-148, 76-97
3. Thurber—p. 212-224

Filmstrips
Animal Environment Series (Curr.)
  How Animals Live in Fresh Water, Pk 2167
  How Animals Live in the Desert, Pk 2168
  How Animals Live in the Arctic, Pk 2169
  How Animals Live in the Grasslands, Pk 2170
  How Animals Live in the Sea, Pk 2171
  How Animals Live in the Air, Pk 2172

CONCEPTS TO DEVELOP

I. WHAT IS THE HISTORY OF LIVING THINGS?

A. What were living things like long ago?
1. The earth is very old.
2. Living things have changed.
3. New living things are appearing and others disappearing.

B. How do we know what living things were like long ago?
1. Fossils tell us.
2. There are several kinds of fossils:
   a. petrification (plants and animals)
   b. impressions (plants and animals)
   c. casts (plants and animals)
   d. encasement (in tar, amber, ice)

C. What do fossils tell us?
1. Fossils show changes have occurred in:
   a. earth's surface
   b. climate
   c. living things

D. How have animals and plants changed?
1. Fossils show development from simple to complex forms.

E. Why have some plants and animals continued to live on the earth while others have died?
1. Changes in the earth's surface and climate make it necessary for living things to:
   a. adapt b. move or c. die

II. THE INTERDEPENDENCE OF LIVING THINGS

A. Animals
1. Some kinds of animals, called social animals, live and work together in a colony.
2. Some animals, such as ants and aphids, are mutually helpful.
3. Some animals grow up in families.
4. Some animals join together in groups for hunting and for protection.
5. Some animals are food for other animals.
6. Plants help animals by providing food and shelter.
7. Bees and other insects carry pollen from one flower to another.
8. Birds eat destructive insects.
9. Earthworms cultivate the soil.
10. Animals scatter seeds.

B. Plants
1. Some plants furnish food or water for other plants.
2. Some plants furnish shade and protection for other plants.
3. Some plants climb on others to reach sunlight.
4. Decayed plants enrich the soil and thus help other plants.
5. Some plants are poisonous to animals.
6. Plants such as fungi destroy other plants.
7. Some plants capture animals for food.
8. Some kinds of plants (bacteria) cause disease in other plants and in animals.
9. Stronger plants take water, food materials and sunlight from weaker ones.

SUGGESTED TREATMENT

TEACHER'S NOTES

Integrations:

HISTORY OF LIVING THINGS

A. This unit can easily be integrated to the section of social studies which stresses history. In this case it would serve as an introduction to the social and economic history of man. Naturally this applies only in the event that the section is organized as a study of man's development from one cultural stage to another, beginning with earliest man. (In doing this it is suggested that to study the whole of man's development, from earliest times to the present, is too complex to study under ordinary conditions.

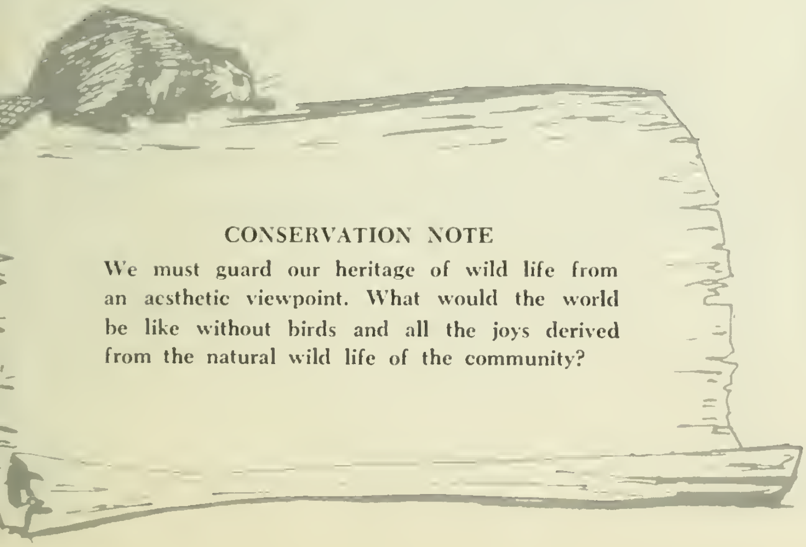
Suggested Activities:

1. **Field Trips**
   - A. If possible, pupils should be permitted to see fossils formations.
   - B. Visit a museum.
2. **Collections**
   - A. Have pupils assist in building up a collection of pictures and fossils.

INTERDEPENDENCE OF LIVING THINGS

General:

This unit should be developed so as to emphasize the balance of nature. The teacher should bring about the realization that plants and animals live in an environment of mutual dependence. Pupils of this age will be interested in the population cycles of local animals (e.g., mice, rabbits, coyotes, Hungarian partridge, etc.). When any animal population increases to a marked degree so also does the population of its natural predators. This process is accompanied by an ever-increasing tendency for the predator population to become so large as to decrease the population of the prey to the critical point where the numbers of both go into a rapid decline.



CONSERVATION NOTE

We must guard our heritage of wild life from an aesthetic viewpoint. What would the world be like without birds and all the joys derived from the natural wild life of the community?

Living Things

SOURCES OF INFORMATION FOR YOUR PUPILS

How Animals Live in the Forest, Pk 2173

The Great American Desert, Pk 2124 (Disney)

How living Things Respond, Pk 2430 (SVE)

Life of the Honey Bee, Pk 3278 (SVE)

Films

Ants, T 601

Aphids, T 432

Birds of Prey, T 102

See Audio-Visual Catalogue

Filmstrip

How an Astronaut Lives in Space, Pk 3782 (F. House)

CONCEPTS TO DEVELOP

C. Plants and Animals

1. Animals use either plants or other animals for food.
2. Insects are great enemies of plants and other animals.
3. All our food comes directly or indirectly from plants.
4. We use plants for clothing, wood, rubber, medicine, etc.
5. Plants hold the soil in place and thus help prevent floods and dust storms.
6. Food, clothing and other products come from animals.
7. Some animals protect us or do work for us.
8. Some animals destroy plant and animal pests.
9. We raise and take care of plants and animals on farms.
10. Some plants and animals have adaptations for protection and shelter.

III. PROBLEMS OF MAN IN SPACE

A. Effects of G-force—a force much like gravity. One gravity (1G) is equal to the gravity we usually feel on earth.

1. The G-force increases as the rate of acceleration increases.
   - a. astronauts may have to endure 7 to 9 G
   - b. this acceleration is the easiest to endure in the supine position
   - c. training in the centrifuge helps
2. The G-force is zero when the rockets are shut off and the capsule is in free flight. This is weightlessness.
   - a. everything that isn't fastened "floats"
   - b. prolonged weightlessness may produce space sickness

B. Materials and environmental conditions within the capsule.

1. Equipment designed to protect the occupant makes up much of the weight of the capsule.
2. The environmental conditions within the cabin are somewhat similar to those on earth.
   - a. the cabin is pressurized
   - b. the temperature is controlled by a type of air conditioner called a heat exchanger
   - c. the air is cycled for re-use
   - d. excess water vapour, carbon-dioxide, and other wastes are removed from the air by chemical means
   - e. supplies of liquid oxygen are stored in tanks
3. The space suit gives more protection.
4. Runny foods are packed into squeeze tubes. Other foods are compressed into bite-sized cubes.
5. During longer trips water may be cycled for re-use.

C. Effects of close confinement (Enrichment).

SUGGESTED TREATMENT

TEACHER'S NOTES

1. **Field Trips**

   Depending upon the locality, field trips might be used to good advantage to observe:

   A. Social animals (e.g., beavers, apiaries)
   B. Mutually helpful animals (e.g., ants and aphids)
   C. Beneficial animals (e.g., earthworms, bees)
   D. Helpful birds (e.g., hawks and owls)
   E. Mutually helpful plants (e.g., wood, violets in shade, vines, fungi)

2. **Classroom Observation Devices**

   A. Build an ant colony
   B. Build an aquarium
   C. Build a terrarium

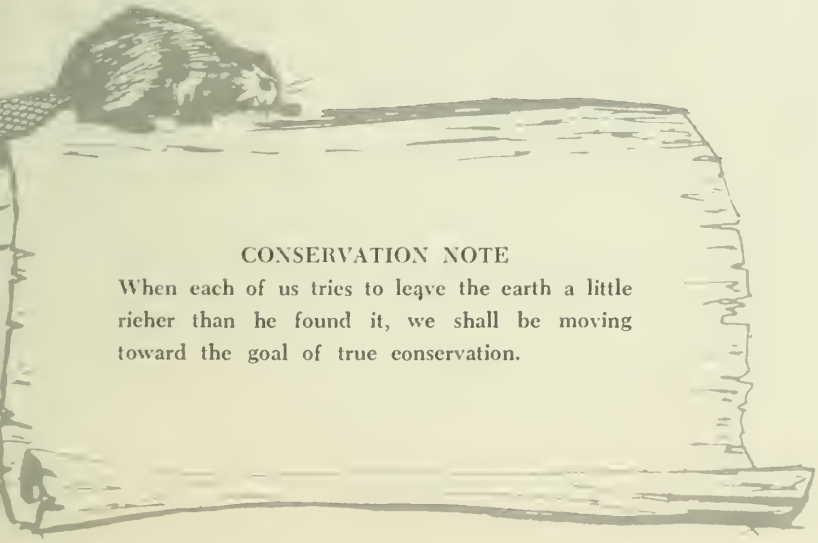
On Space:

1. Make reports on planned trips in space. Descriptions of problems men have had in space capsules.
2. List ways in which man is earth-bound and needs to make provision to take his natural environment with him when he goes into space.

   Material on space travel may be ordered from:

   The National Aviation Education Council
   1025 Connecticut Avenue N.W.
   WASHINGTON 6, D.C.

   (See CLASSROOM AIDS FOR TEACHERS for other sources.)



CONSERVATION NOTE

When each of us tries to leave the earth a little richer than he found it, we shall be moving toward the goal of true conservation.

The Earth and the Universe

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 33-35
2. Craig—Gr. V-p. 44-63
3. Thurber—p. 250-275

Enrichment

1. Craig—p. 98-118, 188-212, 234-255, 28-51, 76-97
2. Thurber—p. 54-80, 27

Audio-Visual Aids

Films

Clouds Go To Work, T 6
Story of a Storm, T 791
Thunder and Lightning, T 729
What Makes Rain? T 514
How Weather is Forecast, Tk 1128

Filmstrips

Climate Series (VPL)
  Effect of the Sun, P 2064
  Effect of Land and Sea, P 2065
  Effect of High Ground, P 2066
  Effect of Ocean Currents, P 2067
How a Weather Map is Made, Pk 3625 (NFB)
Our Weather, Pk 2675 (EBF)
Rain, P 1918 (VPL)
Season, Weather and Climate Series (J. Handy)
  What Weather Is, Pk 2002
  What Makes Weather?, Pk 2003
  Climate, Pk 2004
Understanding Weather Conditions, Pk 1472 (PSP)
Weather, P 1388 (EBF)
What Makes the Wind?, Pk 3382 (YLP)
Why Does it Rain, Snow, Hail and Sleet?, P 3572 (SVE)

CONCEPTS TO DEVELOP

I. WEATHER AND HOW WE FORECAST IT

A. Causes of precipitation

1. Rain
   - a. sun causes moisture to evaporate from the earth's surface
   - b. moisture is held in the air in the form of vapor
   - c. cold air holds less moisture than warm air
   - d. when there is too much moisture in the air for the temperature, precipitation occurs
   - e. in warm weather this precipitation is in the form of rain
2. Hail
   - a. hail is the result of the following things happening:
     - (1) raindrops fall
     - (2) they are caught by up-drafts of air
     - (3) if sufficient height is reached, they freeze
     - (4) becoming heavy, they fall again
     - (5) nos. 3 and 4 may be repeated numerous times, each time altering the size of the hailstone
3. Snow
   - a. refer to "rain" above and the same concepts apply except the air is at freezing temperature
   - b. each snowflake has its own shape
4. Sleet
   - a. this is a mixture of rain and snow

B. Causes of Wind

1. Wind is air in motion.
2. Heat causes air to rise.
3. Colder air rushes in to take its place.

C. Weather Forecasting

1. Weathermen keep records pertaining to
   - a. wind direction and velocity
   - b. moisture content of the air
   - c. temperature
   - d. pressure of air
2. This has enabled them to tell what conditions precede various types of weather.
   - a. high pressure means continuation of current weather
   - b. low pressure precedes a wind which may bring storms of various kinds
   - c. high moisture content may bring rain or snow
3. Use of weather satellites.

SUGGESTED TREATMENT

TEACHER'S NOTES

This unit can be well integrated with geography section of the Social Studies.

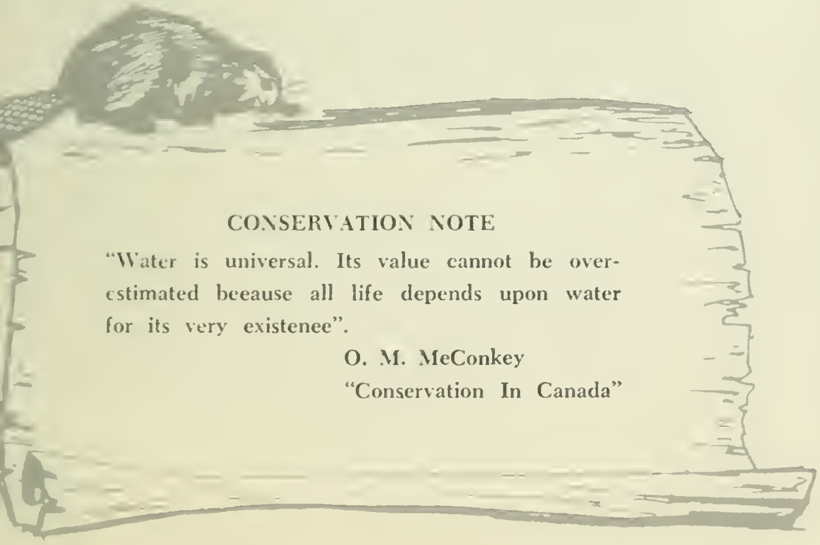
Suggested Activities:

1. **Field Trips**
   Visit a local weather station or airport
2. Classroom Experiments
   - A. To observe weather changes over a period of weeks and to keep a record of these changes.
   - B. To observe how the temperature changes during the day.
   - C. To show that the sun's rays heat some materials more than others.
   - D. To show how air moves in a room.
   - E. To observe condensation of water vapor from the air.

Additional Activities:

1. Send to Department of Transport, Meteorological Division, Ottawa, for weather maps. A group of maps covering a week's time will indicate how the fronts moved across the continent.
2. Have the pupils make a weather map for their locality from data they can gather.
3. If within range of television make maps corresponding to weather forecaster's. Examine them to see how the weather is predicted.

Consult the teacher's editions of the authorized texts for further excellent suggestions.



CONSERVATION NOTE

"Water is universal. Its value cannot be overestimated because all life depends upon water for its very existence".

O. M. McConkey
"Conservation In Canada"

The Earth and the Universe

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

Craig—p. 99-117

Audio-Visual Aids

Filmstrips

Exploring Space Around the Earth, Pk 3466 (FFE)

Information from Satellites, pk 3467 (EFE)

The Earth is Born, Pk 2028 (Life)

How Our Earth Began, Pk 2192 (Curr.)

CONCEPTS TO DEVELOP

II. THE NATURE OF SPACE

A. Definition of space.

Almost a vacuum: only scattered meteors, radiation particles, electrically-charged (ionized) gases.

B. Beginning of space.

1. 99% of the atmosphere lies below 20 miles.
2. At 75 miles up meteors glow from friction against air.
3. At 100 miles enough air remains to slow down satellites.
4. For practical purposes space begins above 100 miles from the earth's surface.

C. Divisions in space.

1. Cislunar space—on this side of the moon.
2. Translunar space—on the other side of the moon, but within the earth's and moon's gravitational field.
3. Interplanetary space—within the sun's gravitational field.
4. Interstellar space—space between the stars.
5. Intergalactic space.
    a. space between the galaxies
    b. never-ending

D. Use of space probes to further our knowledge of space.

1. Meteors and micrometeorites
2. Magnetic fields
3. Solar radiation
4. Belts of Van Allen radiation
5. Moon probes
6. Secrets of Venus probed

E. Theories of the origin of the universe.

1. Theory of the expanding universe (Big Bang Theory).
    (a) about three or four billion years ago everything may have been one big gaseous mass
    (b) this mass exploded and the material moved outward and away
    (c) the material slowly moulded into the forms we know now
    (d) these galaxies are still moving farther apart
2. Other theories—"Steady State", etc. (Enrichment).

SUGGESTED TREATMENT

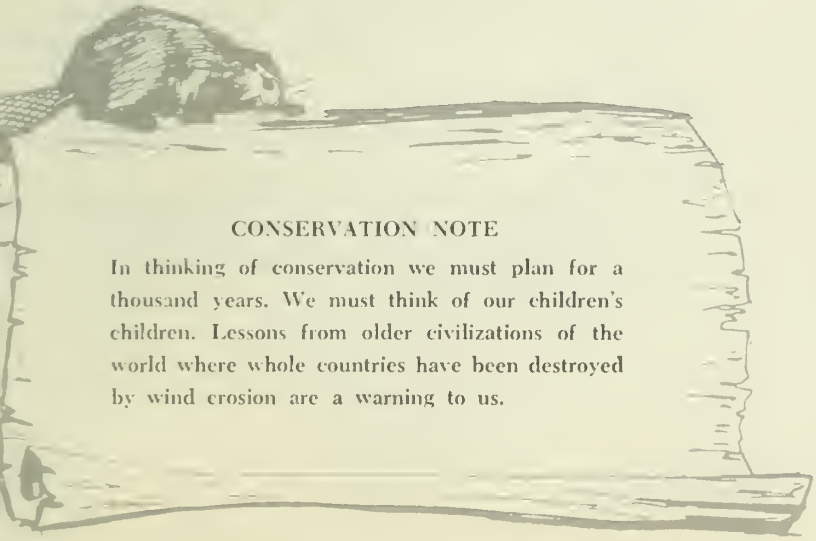
TEACHER'S NOTES

Suggested Activities:

1. Visit a museum where pieces of meteorites may be seen.
2. Visit the Edmonton planetarium if possible.
3. Draw a diagram of the solar system.
4. Collect telescope pictures of the moon.
5. Find out the difference between comets and meteors.
6. Enrichment: if pupils are interested in space, the following may be of interest to them:
   "The True Book of Space," by Podendorf
   "We Read About Rockets and How They Work," by Tannenbaum and Stillman.
7. Through a telescope examine the moon, the planets and their satellites.

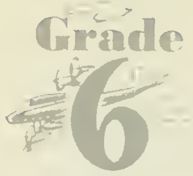
Note: Teachers' References:

"Spacecraft" by Hoggerty, J. J.
Scholastic Book Service
New York, N.Y.



CONSERVATION NOTE

In thinking of conservation we must plan for a thousand years. We must think of our children's children. Lessons from older civilizations of the world where whole countries have been destroyed by wind erosion are a warning to us.



Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 215-232
2. Craig—p. 234-255
3. Thurber—Gr. IV—p. 159-172
   Gr. VI—p. 225-250

Audio-Visual Aids

Filmstrips

Adaptations of Birds, P 214 (EBF)
The Structure of Birds, P 213 (EBF)
Flying with Jets and Rockets, Pk 3371 (McG. Hill)
Jet Propulsion and Gas Turbines, Pk 3015 (G.B.I.)

Films

No Barriers (aircraft development) Tk 1148
History of the Helicopter, T 923

CONCEPTS TO DEVELOP

I. HOW MACHINES CAN FLY

A. Before machines could fly
   1. Men tried to imitate birds but their muscles were not strong enough
      a. Greeks
      b. Da Vinci
      c. Besnier
   2. Plants float by:
      a. large but light wind catchers (milkweed, dandelion, cottonwood)
      b. by whirling like a propeller (maple, ash)
      c. by skimming like a plate (elm)
   3. Insects that fly, fly by flapping their wings very rapidly
   4. Flying squirrels jump and float on the sail made by their skin
   5. A bat has skin-wings
   6. Flying fish leap and sail
   7. All birds can't fly
   8. Most birds are built for flight
      a. their wings are larger than their bodies
      b. they have very strong muscles
      c. their bones are strong and light (hollow and spongy)
      d. they eat a large amount of food for energy
      e. their feathers are built to push the air and yet are very light
      f. gulls glide and soar on rising air currents

B. Gliders
   1. Use the wind and air currents as gulls do
   2. They get off the ground by:
      a. ground tow
      b. air-tow
      c. catapult
      d. reeling in on power take-off of truck
   3. Their travel depends on the air currents
      a. max. height—3 miles
      b. max. distance—500 miles
      c. max. time—50 hours

C. Aeroplanes with motors
   1. Propellers pull plane through air
   2. The curved profile of the wing keeps it in the air by creating unequal pressures
   3. Air tunnels are used to experiment with wings
   4. Most aeroplanes can't slow down or they will drop
   5. Helicopters move their wings and therefore can stay in the air

D. First Aeroplanes
   (examine story of early flights, e.g., Wright Bros., etc.)

E. Jet Aeroplanes
   1. Jet aeroplanes fly in the same way that balloons fly when we cut the string that holds the nozzle
   2. Scientists have to develop new shapes to meet the needs of tremendous speeds

SUGGESTED TREATMENT

TEACHER'S NOTES

Activities:

1. **Field Trips**

   Examination of seeds that fly in the wind. Study butterflies, dragonflies, for wing arrangement.

2. **Additional Activities**

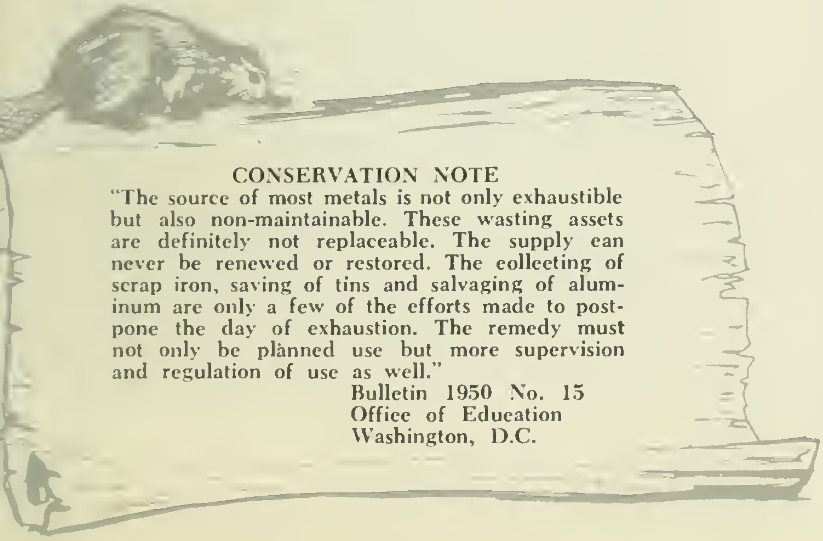
   A. Trip to local airport.

   B. Construction of model aeroplanes, gliders, parachutes, as a group project.

   C. Gather pictures of various kinds of aeroplanes. Identify.

   D. Gather pictures showing cuts of interiors of planes, instrument boards, etc. Discuss use of various instruments.

Consult the teacher's editions of the authorized texts for further excellent suggestions.



CONSERVATION NOTE

"The source of most metals is not only exhaustible but also non-maintainable. These wasting assets are definitely not replaceable. The supply can never be renewed or restored. The collecting of scrap iron, saving of tins and salvaging of aluminum are only a few of the efforts made to postpone the day of exhaustion. The remedy must not only be planned use but more supervision and regulation of use as well."

Bulletin 1950 No. 15
Office of Education
Washington, D.C.

Grade 6

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Enrichment Material

"Airplanes at Work"—Whipple

Audio-Visual Aids

Filmstrips

Airplanes, Jets and Rockets Series (J. Handy)
  What Makes an Airplane Fly?, Pk 3445
  How is an Airplane Controlled? Pk 3446
  Safety in Flight, Pk 3447
  How do Helicopters Fly?, Pk 3448
  How do Jets Fly?, Pk 3449
  Rocket Power for Space Travel, Pk 3450
Controlling Airplanes, Pk 3370 (McG. Hill)
How Airplanes Fly, Pk 2876 (YAF)
Jet Engines and Rockets, Pk 2302 (Curr.)
Travel in Space, Pk 2513 (EBF)
The Wright Brothers, Pk 3198 (J. Handy)

Films

Jet Propulsion, T 942
Conquering the Airways, P 1468 (PSP)
Air Transportation, Pk 2214 (Curr.)

Filmstrips (Section I-F)

Work of Astronomers and Space Travel, P 3343 (SVE)
Travel in Space, Pk 2513 (EBF)
Space Travel A.D. 2000, Pk 3809 (SVE)
What are Space Stations?, Pk 3671 (J. Handy)
Rockets to the Moon, Pk 2573, (McG. Hill)
Rockets to Space, Pk 3670 (J. Handy)
Rocket Power for Space Travel, Pk 3450 (J. Handy)

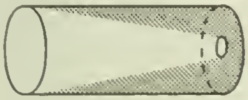
CONCEPTS TO DEVELOP

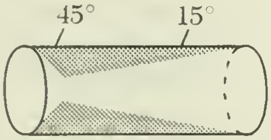
F. Rockets and space vehicles.

1. How rocket engines are different from other engines.
   a. work according to Newton's Third Law of Motion which simply stated says "for every action there is an equal but opposite reaction"
      i. the escape velocity of the gases from the rocket cause it to move in the opposite direction
      ii. the faster the gases escape, the faster the rocket moves
   b. chemically-fuelled rocket engines carry not only their own fuel but also their own oxidizer. Therefore they can operate where there is no atmposphere.
   c. nuclear power and ion power are being experimented with for the propulsion of rocket engines
2. The need for man in space flights.
   a. the automatic instruments are masterpieces but are no match for the human brain
   b. these advanced instruments can only report; they cannot evaluate what they "see"
   c. the combination of man and instruments is best
   d. satisfaction of man's curiosity
3. Launching a satellite.
   a. multi-stage rockets are used because as each rocket stage exhausts its fuel, it drops off, thus reducing the total weight of the launch vehicle and making the job easier for the succeeding rockets
   b. the two main kinds of chemical fuels for rockets are liquid and solid chemicals
   c. velocity required for:
      i. orbit around earth—about 18,000 miles per hr.
      ii. reaching the moon, Mars, Venus, (escaping Earth's gravity)—25,000 miles per hour
   d. space vehicles may be guided:
      i. from within the capsule
      ii. by those ground stations which are two-way communication control stations
4. Benefits from space travel or satellites.
   a. new knowledge of the solar system, space, etc.
   b. use in weather forecasting
   c. improving world communication
   d. serving as aids to navigation
   e. mapping the earth more accurately
5. Space travel in the future. (Enrichment)
   a. space stations
   b. describe trip to moon, Venus, Mars

Suggested Activity:

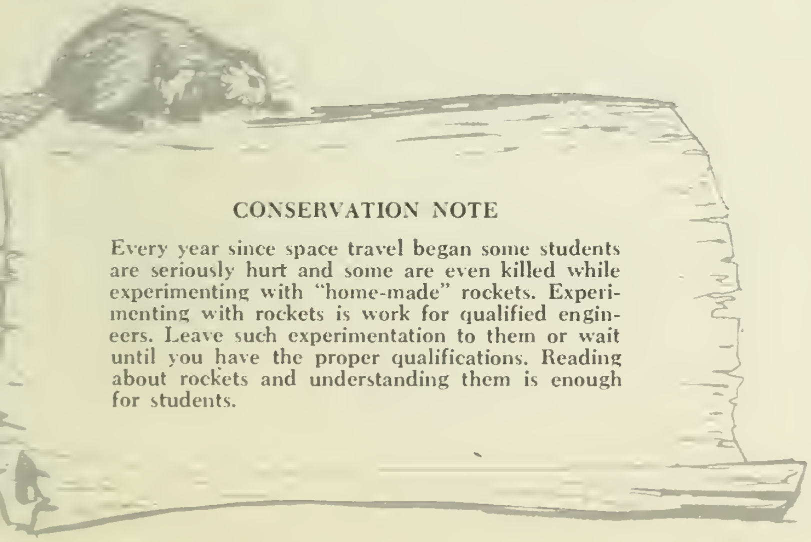
1. The action-reaction principle can be seen in the skittering of an inflated balloon when it is released. Try carving different shapes of "exit nozzles" from balsa wood or plastic to insert in the neck of a balloon to see if one shape is better than another in keeping the balloon moving longer or farther. Below are two suggested shapes.





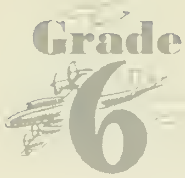
The 15-45 degree nozzle is the shape that seems to be the best for actual rocket motors.

2. Find a "ham"-radio operator in the community. He may be able to show how he monitors man-made satellites and tell about monitoring one of the early ones.
3. Investigate types of liquid and solid chemical fuels. Consider advantage of each. Watch for the development of the ion and proton rocket.



CONSERVATION NOTE

Every year since space travel began some students are seriously hurt and some are even killed while experimenting with "home-made" rockets. Experimenting with rockets is work for qualified engineers. Leave such experimentation to them or wait until you have the proper qualifications. Reading about rockets and understanding them is enough for students.



Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp, Gr. V p. 71-97
2. Craig—p. 213-233
3. Thurber—p. 105-130, Gr. IV p. 129-144

Audio-Visual Aids

Films

Simple Machines, T 27

Filmstrips

Introducing Inclined Planes, Pk 3246 (YLP
Introducing Levers, Pk 3262 (YLP)
Levers, P 3162 (C. Ground)
Simple Machines, P 1381 (EBF)
Simple Machines, P 3749 (SVE)
Simple Machines Make Work Easier, Pk 3441 (PSP)

CONCEPTS TO DEVELOP

II. HOW MACHINES HELP US TO DO WORK

A. What is work? Work is force applied through distance

B. What is a machine?

1. A device to make work easier
2. A force must be used to make a machine work
3. Simple machines have only a few parts
4. Complex machines are made up of simple machines put together differently

C. Levers

1. All levers have three parts
   a. fulcrum
   b. the part where force is used
   c. the part where work is done
2. The nearer the fulcrum of the lever is to the weight, the easier the weight is to lift
3. The lever increases the force or changes the direction of the force
4. Do experiments: see-saw, crow-bar, prying lids from cans, scissors

D. Inclined Planes

1. A weight can be pushed or pulled up an inclined plane more easily than it can be lifted
2. A wedge is two inclined planes joined together
3. A screw is an inclined plane that winds around as it climbs

E. Pulleys

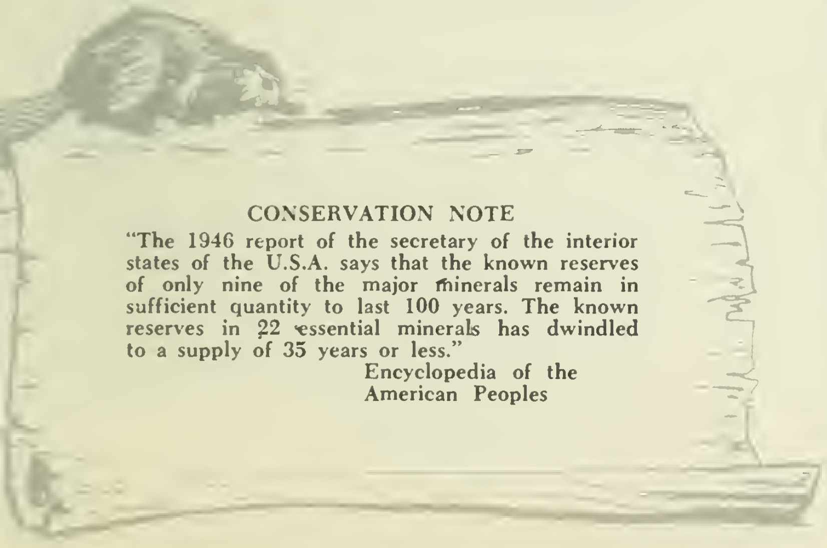
1. A fixed pulley can be used to change the direction of force.
2. A movable pulley can be used to increase the force.
3. Pulleys can be combined in a block and tackle. The more movable pulleys that are used, the easier it is to move the weight.

SUGGESTED TREATMENT	TEACHER'S NOTES

Suggested Activities:

1. Experiment to show how levers make work easier.
2. Experiment to show how an inclined plane makes work easier.
3. A screw is an inclined plane that winds around as it climbs.
4. Experiment to show how friction is reduced by smooth surfaces.
5. Experiment to show a wedge is two inclined planes together.
6. Correlate with arithmetic problems: e.g.

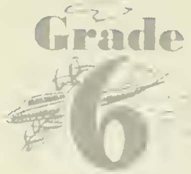
   "If two men with the proper tools can do as much work as six men without the proper tools, then how many man hours of labour may be saved on a job which takes six and one half-hours to complete if the two men with the proper tools were hired to do the job." Point out that wise use of tools is a good conservation practice.



CONSERVATION NOTE

"The 1946 report of the secretary of the interior states of the U.S.A. says that the known reserves of only nine of the major minerals remain in sufficient quantity to last 100 years. The known reserves in 22 essential minerals has dwindled to a supply of 35 years or less."

Encyclopedia of the American Peoples



Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Enrichment Reading

"Everyday Machines and How They Work"—Schneider

"The Story of Power" —Edward Stoddard

Audio-Visual Aids

Filmstrips

Friction, P 349 (J. Handy)

Gravity, Pk 2811 (YAF)

Introduction to Energy, Pk 3263 (YLP)

CONCEPTS TO DEVELOP

E. Pulleys
   1. A fixed pulley can be used to change the direction of force
   2. A movable pulley can be used to increase the force
   3. Pulleys can be combined in a block and tackle. The more movable pulleys that are used, the easier it is to move the weight

F. Wheel and Axle
   1. When a big wheel is fastened to a small axle, a little force on the wheel will move a heavy weight attached to the axle
   2. The wheel turns the axle, which does the work
   3. The turn on the wheel gives the axle more force
   4. One wheel can turn another
      a. by connecting them with a belt
      b. by connecting them with gears
      c. a large wheel turning slowly will turn a small wheel rapidly

G. How can we make machines work better?
   1. Friction results when two things rub against each other
   2. Friction wastes energy and thus requires extra force
   3. Friction is reduced by making surfaces as smooth as possible
   4. Friction causes materials to wear out and to become hot
   5. Friction is reduced by using oil, grease, wheels, rollers and ball bearings
   6. Friction sometimes helps machines to work better
      a. car on slippery street has no friction so the wheels only spin about
      b. there must be friction to make roller skates go
      c. friction is needed for starting any motion

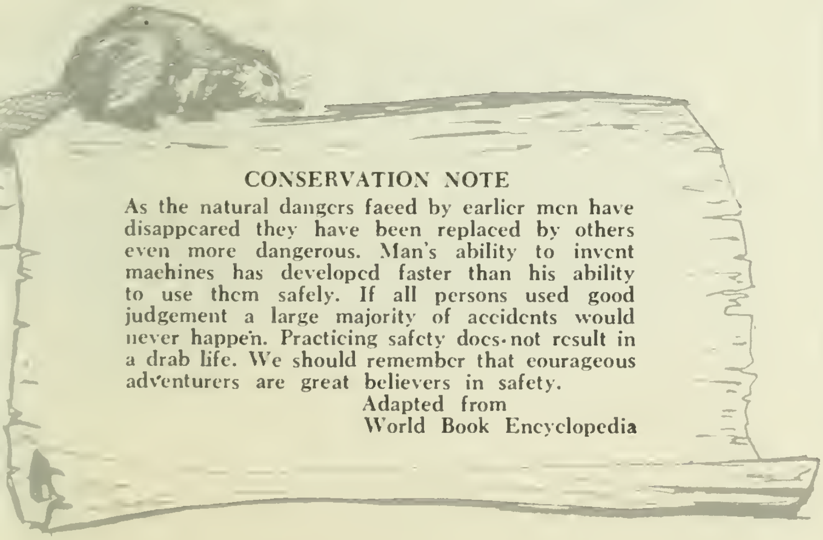
H. Safety
   1. Machines can be dangerous and must be used carefully
   2. Accidents cause injuries and waste time and money.
   3. Wise use of manpower includes using the best safety measures.

SUGGESTED TREATMENT

TEACHER'S NOTES

Activities:

1. Experiment to make a fixed pulley.
2. Experiment to show how a movable pulley is used.
3. Experiment to show how a block and tackle make work easier.
4. Children should observe and use: clothesline, curtains, elevators, the flag being raised and lowered.
5. Make sets of rules for highway safety, farm safety, etc., dealing primarily with the operation of machines.



CONSERVATION NOTE

As the natural dangers faced by earlier men have disappeared they have been replaced by others even more dangerous. Man's ability to invent machines has developed faster than his ability to use them safely. If all persons used good judgement a large majority of accidents would never happen. Practicing safety does not result in a drab life. We should remember that courageous adventurers are great believers in safety.

Adapted from
World Book Encyclopedia

Grade 6

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 9-29
2. Craig—Gr. IV—p. 107-127
3. Thurber—p. 131-158

Audio-Visual Aids

Filmstrips

Cause and Nature of Sound, Pk 3596 (J. Handy)

Ears and Hearing, P 1419 (EBF)

How Sound Travels, Pk 3597 (J. Handy)

Sound Waves, Pk 3349 (SVE)

You and Your Ears, Pk 3155 (Disney)

Your Ears at Work, Pk 3539 (J. Handy)

Films

Learning About Sound, T 1256

Your Ears, T 395

CONCEPTS TO DEVELOP

III. WHAT IS SOUND AND HOW DOES IT TRAVEL?

A. How are all sounds alike?
  1. All sounds are made by vibration

B. How do living things make sounds?
  1. In people and most higher animals sound is produced by vibration of vocal cords
  2. In many insects sound is made by vibration of wing parts

C. How do sounds travel?
  1. Sounds travel by vibrations in the air called sound waves
     a. sound waves travel in all directions from a thing that is vibrating
     b. sounds travel through solids, liquids and gases
     c. sound travels at about 1100 ft. per second in air

D. How can we control sound waves?
  1. Sound waves can be guided to travel in certain directions
     a. megaphone
  2. Sound waves can be reflected to make an echo
  3. Echoes in rooms can be prevented by using special materials on walls and ceilings

E. Why are sounds different?
  1. The highness or lowness of a sound depends upon the speed of vibration. The faster the material vibrates the higher the sound produced
     a. thin materials can vibrate faster than thick ones
     b. more tightly material is stretched, the faster it can vibrate
     c. short lengths of material can vibrate faster than long ones
  2. The loudness of the sound depends upon the force with which it vibrates
     a. how far it moves in vibrating
  3. Vibrations may be too fast or too slow for us to hear them—inaudible
     a. move hands—too slow—too low
     b. dog whistle—too fast—too high
     c. range (normal—20-20,000 vibrations per second)

F. How do musical instruments make sound?
  1. All musical instruments make sounds by making air vibrate
     a. in stringed instruments, sounds are made by vibration of strings. High and low sounds vary according to length, thickness and tightness of strings
     b. in wind instruments high sound is made by vibration of a short column of air and a low sound made by vibration of long column of air

G. How our ears work
  1. We hear sounds because the sound waves travel towards our ears and make the inner parts vibrate. Nerves carry the message of the vibration to the brain which interprets them into meanings
  2. It is very important to take good care of the ears

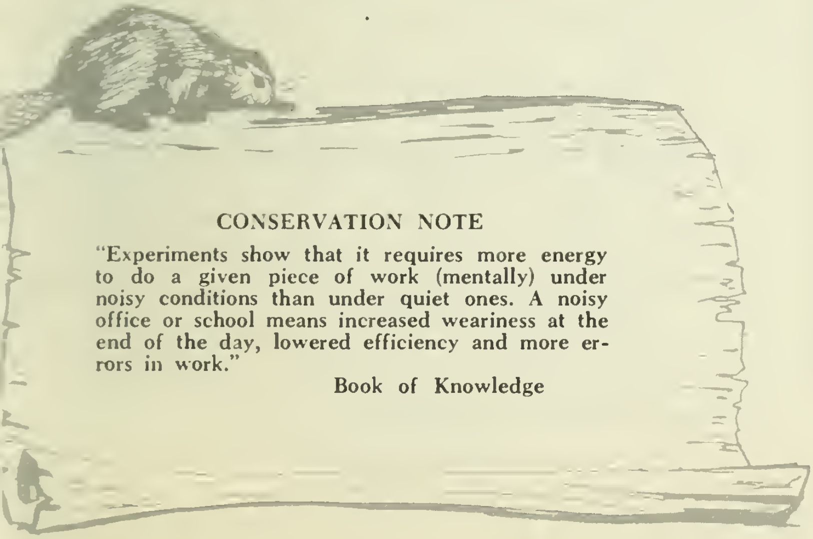
SUGGESTED TREATMENT

TEACHER'S NOTES

The Section on "What is Sound and How Does it Travel" could form the basis of a good science teaching unit.

Experiments

1. To observe different kinds of sound makers—metallic, wooden, etc.
2. To observe that the prongs of a tuning fork vibrate when struck.
3. To show how moving air causes vibration.
4. To show that sound waves travel through the air and travel in all directions.
5. To find out whether sound travels in solid material.
6. To show why some sounds are louder than others.
7. To show how different sounds are made by musical instruments.
8. To show long and short columns of air make different sounds.



CONSERVATION NOTE

"Experiments show that it requires more energy to do a given piece of work (mentally) under noisy conditions than under quiet ones. A noisy office or school means increased weariness at the end of the day, lowered efficiency and more errors in work."

Book of Knowledge

Grade 6

Energy and Machines

SOURCES OF INFORMATION FOR YOUR PUPILS

Texts

1. Beauchamp—p. 157-181
2. Craig—p. 118-143
3. Thurber—p. 81-104

Audio-Visual Aids

Filmstrips

Eyes and Their Care, P 1063 (EBF)
Light, Pk 2812 (YAF)
Light and How It is Reflected, Pk 3142, (SVE)
Light and How It is Refracted, Pk 3143 (SVE)
Light and How It Travels, Pk 3594 (PSP)
Putting Light to Work, Pk 2575 (PSP)
What is Color?, Pk 2906 (PSP)
You and Your Eyes, Pk 3154 (Disney)
Your Eyes at Work, Pk 3538

Films

Eyes and Their Care, T 9
Light and Shadow, T 675
The Story of Light, Tk 1087
How Man Made Day, T 584

CONCEPTS TO DEVELOP

IV. WHAT DO WE KNOW ABOUT LIGHT?

A. Where do we get light?
   1. Most of our light comes from some material that is heated till it burns
   2. Cold light—fireflies, sea animals, radium paint, etc.
   3. Many ways have been used to get light; e.g. candles, sunlight, starlight

B. How does light travel?
   1. Light travels at a tremendous speed
   2. Light travels in a straight line
   3. Light travels outward from its source in all directions

C. Why can we see things?
   1. We can see objects because they give off light or reflect light
   2. Light is reflected by most materials
      a. smooth surfaces reflect more light than rough surfaces
      b. light colored materials reflect more light than dark colored materials
      c. moonlight
   3. Light is absorbed by many materials
      a. dark colored materials absorb more light than light colored materials
   4. Light can pass through some materials but not through others
      a. opaque materials
      b. transparent materials
      c. translucent materials

D. Why can you see yourself in a mirror?
   1. An object can be seen in a mirror because light travels from the object to the mirror and is reflected back again
   2. Light travels away from the mirror on the same slant at which it strikes the mirror

E. What do lenses do to light?
   1. Light is bent when it travels through a lens
   2. The bending of light that travels from an object through a lens changes the apparent position of size of the object

F. How do we see things which are small or very far away?
   1. The use of lenses can make far away objects seem larger

G. How our eyes work
   1. Different parts of the eye work together so that we can see
   2. Too much light is dangerous: looking into the sun, looking at the light from ore welding

H. Why do things have different colors?
   1. The color of an object is caused by the way in which it reflects certain light rays and absorbs others
   2. Sunlight is a mixture of light rays of many colors
   3. The colors of sunlight are separated when sunlight passes through a prism
   4. White is not a color, it is a mixture of all colors
   5. Black is not a color, it is lack of color

I. Proper lighting is important
   1. Amounts for various purposes
   2. Types of lighting, indirect, etc.

SUGGESTED TREATMENT

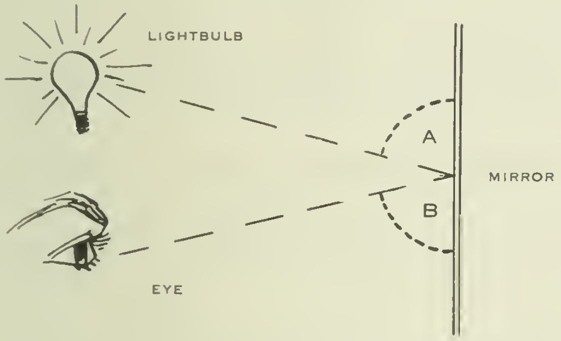
TEACHER'S NOTES

Classroom Experiments

1. To show that light travels in a straight line.
2. To find out how rough surfaces reflect light.
3. To show how light is reflected in a mirror.
4. To show that light is bent by water, etc.
5. To show how light is focussed by a lens.
6. To observe how a slide projector projects pictures.
7. To observe the outer structure of the eye and how it reacts to light.
8. To observe the separation of colors when sunlight passes through a glass prism.

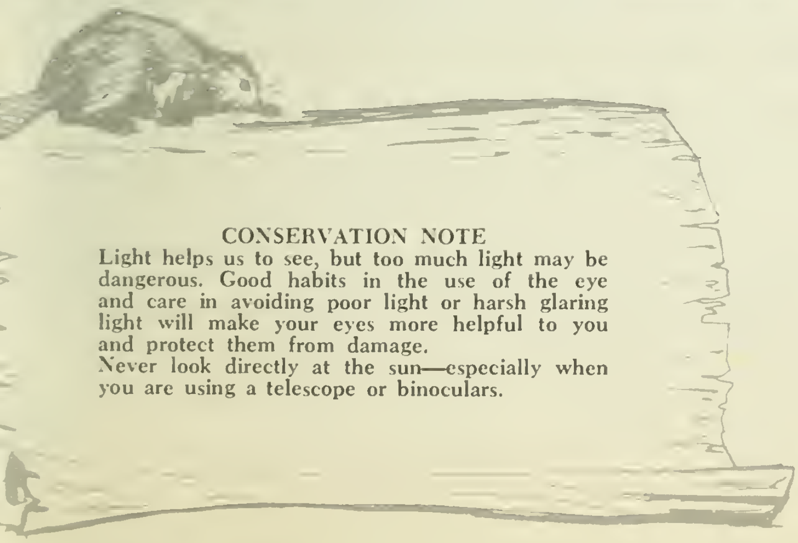
Examination of Concave and Convex Lenses

Have children divide into groups of two in order to examine the eyes. Have them shut their eyes tightly for a moment and then open and watch their partner's eyes to see them adjust to the light.



See that the angle of incidence corresponds to the angle of reflection.

Consult the teacher's editions of the authorized texts for further excellent suggestions.



CONSERVATION NOTE

Light helps us to see, but too much light may be dangerous. Good habits in the use of the eye and care in avoiding poor light or harsh glaring light will make your eyes more helpful to you and protect them from damage.
Never look directly at the sun—especially when you are using a telescope or binoculars.

TEACHER'S NOTES:

Teacher References

1. **A Sourcebook for Elementary Science:** Hone, Joseph and Victor. Harcourt Brace, and World (1962). (In Canada, Longmans, Green and Co. Ltd.)

2. **Elementary School Science and How to Teach It:** Blough, G. O. and Huggett, A. J., The Dryden Press, New York, (1951). (In Canada, The Ryerson Press, Toronto.)

3. **Teaching Science in the Elementary School:** Burnett, R. W. Rinehart & Co. Inc., Toronto (1953).

4. **Science for Today's Children:** National Education Association, Dept. of Elementary School Principals. Thirty-second Yearbook, Washington, D.C.: the Department 1953.

5. **Science in the Elementary School:** Craig. National Education Association, What Research Says to the Teacher series.

6. **Birds of Alberta** by Salt and Wilk.

7. **Native Trees of Canada:** Dept. of Resources and Development of Forestry Branch, Ottawa. $1.50.

8. **Space Craft:** Hoggerty J. J., Scholastic Book Service, New York, N.Y.

9. **A Half Century of Science and Mathematics Teaching:** Central Association of Science and Mathematics Teachers. George Banta Publishing Co., Mensha, Wis. 1950.

10. **Science for the Elementary School Teacher:** Craig, Gerald S., New Edition, Ginn and Co., Boston, 1958.

11. **Better Teaching Through Elementary Science:** Greenlee, Julian. William C. Brown Co., Dubuque, Iowa, 1954.

12. **Helping Children Understand Science:** Freeman, K. and others. John C. Winston Co., Philadelphia, 1954.

13. **Teaching Science to Children:** Greenlee, Julian. Second revised edition. William C. Brown Co. Dubuque, Iowa, 1955.

14. **Modern Science Teaching:** Heiss, Elwood D. Obourn, Ellsworth S. and Hoffman, Charles. Revision of **Modern Methods and Materials for Teaching Science**, MacMillan Co., New York, 1950.

15. **Science Education in American Schools:** National Society for the Study of Education. Forty-sixth Yearbook, Part I. Also Fifty-ninth Yearbook "Rethinking Science Education." University of Chicago Press, Chicago, 1947.

16. **Science for Children and Teachers:** Zim, Herbert S. Association for Childhood Education International Bulletin No. 91, Washington, D.C., 1953.

17. **Conservation in Canada:** McConkey, O. M., J. M. Dent & Sons (Canada) Ltd., Toronto.

18. **Classroom Aids for Teachers:** Department of Education, Edmonton, Alberta.

19. **Conservation Illustrated:** Handbook on Our Natural Resources. Canadian Nature Magazine, 177 Jarvis Street, Toronto, Canada.

20. **Birds of Canada:** P. A. Traverner. Musson Book Co. Ltd., Toronto.

21. **A Field Guide to the Birds:** R. T. Peterson. Haughton Mifflin Co., Boston. About $3.50.

These references are valuable and should be considered first in choosing books for a teacher's reference library.

PAMPHLETS FOR CONSERVATIONS

Hunters and Hunted
Attracting Birds
Bird Protection
(Canadian Wild Life Service)

Miracle Wood (Story of Sylvaply) refers to natural seeding and reforestation procedures. Published by MacMillan & Bloedel Ltd., Vancouver, B.C.

Oil Seekers—Information Div. Imperial Oil, 606 - 2nd Street West, Calgary. (Oil Conservation) p. 18 and 19.
Wasteful and Efficient Production of Oil.

The Story of Oil—Published by Western Canada Petroleum Ass'n., Calgary, Alta. P. 37. Wasteful and Efficient Production of Oil.

The World Book Encyclopedia—Field Enterprises. Unit Teaching Plan No. 80, Pamphlet on Conservation

Deals with—Need for Conservation
- Need for Conservation
- Soil Conservation
- Water Conservation
- Forest Conservation
- Wildlife Conservation
- Mineral Conservation

The pamphlet also refers to references in World Book.

Conservation of Wildlife—Royal Bank of Canada

CONSERVATION REFERENCES

Look and Learn—Gage Grade I

Pictures—Conservation can be brought in, in connection with pictures of birds, useful animals, farm crops, gardens, etc.

All Around Us—Gage

P. 3-28—Conservation of Wildlife may be introduced in connection with the pictures of Wildlife.

P. 34-40—Conservation of human energy by the use of machine energy.

P. 64-73—Conservation of Plants—Use of water to get better plants. General care of plants.

How Do We Know—Gage

Conservation of Wildlife—Introduced in connection with pictures of Wildlife. P. 4-33. (The book does not do it but the opportunity is there.)

Conservation of Soil—P. 53-70. Use in connection with enriching garden soil to make better vegetables.

Conservation of Plants—Keeping down plant enemies to give garden and field and forest plants a chance to grow. P. 70-72.

Discovering Our World Bk. I—Gage

Tree Conservation—P. 206-207 (brief) Not much worthwhile.

Discovering Our World Bk. 2—Gage

Conservation of Living Things—P. 38-43.

Conservation of Machines—cutting down friction. Use of lubricants to prolong the life of moving parts. P. 93-96.

Conservation of Forests—control of fire, p. 150.

Conservation of Fuels—p. 160-164.

Prevention of Fires—conservation of buildings, forests, etc., p. 164-175.

Conservation of Vitamins & Minerals important for Health p. 194-204.

Conservation of Plants—protecting plants from their enemies, p. 239-244.
(Very good in this book)

Discovering Our World Bk. 3—Gage

Conservation of Soil—as related to wind and water erosion p. 70-80.
Not stressed as such but the opportunity is present.

Conservation of Soil—p. 87-93.

Conservation of Food—protecting food from germs etc. p. 116-119.

Conservation of Water for use in water power or irrigation p. 124-126.

Conservation of Flowers—pollination by insects p. 243-244.

Conservation of Wild Life—opportunity for teaching in connection with materials on p. 260-270.

GINN SERIES—CRAIG

Science Near You—Gr. 1

Opportunity to teach bird conservation through protection of trees or supplying trees to attract birds p. 10-11.

Soil Conservation p. 82-87 (rocks and grass to hold soil) Good.

Science Around You—Gr. 2

Conservation of Water for Plant Use—irrigation p. 10-11 also p. 106-107.

Soil Conservation—by use of leaves to enrich soil p. 22.

Soil needs care

Plants to hold soil p. 132-133.

Leaves help us p. 139.

Forests as home for useful animals p. 136-137.

Forests as a means to stop soil erosion p. 138.
(Good on Conservation)

Discovering with Science—Gr. 4

Conservation of moisture in desert plants p. 52-53.

Using materials wisely (waste not—want not) p. 236-254.
Water p. 238-242.
Coal p. 243-244.
Oil p. 245-248.
Natural Gas p. 249.
Metals of Our Earth p. 250-254.

THURBER—EXPLORING SCIENCE

Grade 1

Conservation of Wild Life might be introduced in connection with pictures of animals, birds or fish, p. 29-30.

Using grass and leaves to enrich the soil, p. 142.

Protection of Birds—Conservation of Wild Life, p. 144.

Grade 2

Opportunity to teach conservation of plants by controlling grasshoppers, p. 14-15.

Protecting Birds—not molesting nests, p. 147.
(Very Little)

Grade 3

Grass as a means of preventing soil drifting, p. 177.
(Merely Mentioned).

Grade 4

Feeding Birds in Winter—Conservation of Bird Life, p. 83.

Water Conservation—dams, p. 99.

Conservation of moisture in desert plants (inferred), p. 101.
(Not Too Much)

Grade 5

(Not Pointed Up)—but "Honeybees", p. 18-24 provides material for plant conservation through pollination and propagation of floral plants.

Fire Prevention—Conservation of homes, forests, etc., p. 46-48.

Erosion by Water—relate to soil conservation, p. 49-61.

Conservation of heat—insulation, p. 109; thermostat, p. 112.

Grade 6

Saving the Soil, p. 27-52.

Bird Conservation—Birdhouses, p. 210-211.

Conservation of Fish, p. 314-315.

IT'S NO LONGER AGAINST THE RULE

Today if Mary's little lamb
Should follow her to school
The teacher wouldn't turn him out.
It's not against the rule.

Instead she'd bring him in the room
And call the children near
Each child would get to feel his wool,
Might even learn to shear.

What children bring to school these days
Is any thing they find
You'd really think that Mother Goose
Was not so far behind.

Yes, fish and snakes and tadpoles too
As well as birds and squirrels
Are going to our schools today
Along with boys and girls.

They bring in shells and stamps and rocks
They study ants and bees
They learn of health, which food to eat,
Plant seeds of beans and peas.

Does pupil or teacher enjoy most
This modern way of learning,
Where city children learn the truths
Revealed by the season's turning?

By L. A. M. Barnette,
Courtesy, National Elementary
Principals Association.

Addresses of Filmstrip Distributors

Although films and filmstrips listed in this outline are available from the Audio-Visual Aids Branch of the Department of Education and the numbers used are those given in their catalogues, a list of addresses of producers of filmstrips is included for those schools in which a filmstrip library is being planned.

On the left side of this page the names of filmstrip producers, abbreviated as in the previous pages are listed in alphabetical order. On the right side are given the names of distributors through whom you can purchase.

The Audio-Visual Aids Branch does not act as a distributor or agent for the sale of filmstrips. Orders should not be sent to this Branch. The Division of Visual Instruction, Department of Extension, University of Alberta, has provided such a service for any filmstrips and, no doubt, will be willing to do so again if requested.

SOURCE FOR AUDIO-VISUAL AIDS MATERIAL

Australian Embassy	Australian High Commissioner's Office OTTAWA, Canada
B.I.F.	British Instructional Films Film House Wardour Street, LONDON, W. 1, U.K.
C.W.N.G.	Canadian Western Natural Gas 140 - 6 Avenue West CALGARY, Alberta
Curr. (Curriculum Films)	Johnson Bros. Educational Films & Records 5512 - 20 Avenue N.W. SEATTLE 7, U.S.A.
Disney	Encyclopaedia Britannica Films Inc. 978 Queen's Way TORONTO, Canada
D. Mail	Daily Mail School School Aid Department New Carmelite House LONDON, E.C. 4
E.B.F.	Encyclopaedia Britannica Films Inc. 978 Queen's Way TORONTO, Canada
E.F.D.	Educational Film Distributors 577 Jarvis Street TORONTO 5, Ontario
F.F.E.	Films for Education Audio Lane NEW HAVEN, Conn., U.S.A.
Eye Gate	Ryerson Film Service 299 Queen Street West TORONTO 5B, Ontario
F. House	432 Park Ave. S. NEW YORK 16, N.Y.
G.B.I. (Gaumont British Instructional)	J. Arthur Rank 16 mm. Distributors Limited 277 Victoria Street TORONTO, Ontario
Gunter	D. C. Lofquist A—9901 - 104 Street EDMONTON, Alberta

J. H. (Jam Handy)	General Films Ltd. 1534 - Thirteenth Avenue REGINA, Saskatchewan
Life	Life Magazine Incorporated 9 Rockerfeller Plaza NEW YORK 20, N.Y.
McG-Hill	McGraw-Hill Co. of Canada Limited (Text-Film Department) 253 Spadina Road TORONTO 4, Ontario
N.F.B.	National Film Board South Side Post Office EDMONTON, Alberta
P.S.P. (Popular Science Publishing)	McGraw-Hill Co. of Canada Ltd. (Text-Film Department) 253 Spadina Road TORONTO 4, Ontario
R. Peterson	Educational Film Distributor 577 Jarvis Street TORONTO 5, Ontario
S.V.E.	Society for Visual Education Inc. 1345 West Diversey Parkway CHICAGO 14, Illinois
Trindl-King	Trindl-King 123 South Bowling Green Way LOS ANGELES 24, California
U.K.I.S.	United Kingdom Information Service 119 Adelaide Street West TORONTO, Ontario
Unicorn, Ltd.	Unicorn Head Visual Aids Ltd. 35 Portland Place LONDON, W.I., U.K.
V.P.L.	Visual Publications Ltd. 197 Kensington High Street LONDON W. 8, U.K.
Wayne Univ.	Audio-Visual Materials Consultation Bureau Wayne University DETROIT 1, Michigan
Y.A.F. (Young American Films)	McGraw-Hill Co. (Text-Film Department) 253 Spadina Road TORONTO 4, Ontario
Y.L.P. (Your Lesson Plan)	D. C. Lofquist A—9901 - 104 Street EDMONTON, Alberta
Br. Min. of Foods	Ministry of Agriculture, Fisheries and Food 2-10 Sussex Place Regent's Park, LONDON, N.W. 1, U.K.

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FEB 12 '70
FEB 19 '70
RETURN
CURR DE 15 '70
DEC 11 RETURN
[illegible] OC 2 '72
OCT 10 RETURN
[illegible] 2 '72
OCT 23 [illegible]

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Elementary school science. -

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